8.0 DEVELOPMENT OF CONTROL AND TREATMENT OPTIONS

This section describes the combinations of pollution prevention practices and end-of-pipe wastewater treatment that EPA configured as technology options for consideration as bases for the Transportation Equipment Cleaning Industry (TECI) effluent limitations guidelines and standards. (Note that water conservation practices, which are not part of EPA's technology bases, are incorporated into EPA's costing methodology for several subcategories. See Section 9.2.7 for additional information.) EPA developed technology options for the following:

- Best practicable control technology currently available (BPT);
- Best conventional pollutant control technology (BCT);
- Best available technology economically achievable (BAT);
- New source performance standards (NSPS);
- Pretreatment standards for existing sources (PSES); and
- Pretreatment standards for new sources (PSNS).

Technology bases for each option for each regulation were selected from the pollution prevention and wastewater treatment technologies described in Section 7.0. Sections 8.2 through 8.7 discuss the regulatory options that were considered for each of the regulations listed above.

8.1 Introduction

The final regulations establish quantitative limits on the discharge of pollutants from industrial point sources. The applicability of the various limitations for the TECI is summarized below:

	Direct Discharge	Indirect Discharge	Existing Source	New Source	Conventional Pollutants	Priority and Nonconventional Pollutants
BPT	✔		✔		✔	✔
BAT	✔		✔			✔
BCT	✔		✔		✔	
NSPS	✔			✔	✔	✔
PSES		✔	✔			✔
PSNS		✔		✔		✔

All of these regulations are based upon the performance of specific technologies but do not require the use of any specific technology. The regulations applicable to direct dischargers are effluent limitations guidelines which are applied to individual facilities through National Pollutant Discharge Elimination System (NPDES) permits issued by EPA or authorized states under Section 402 of the Clean Water Act (CWA). The regulations applicable to indirect dischargers are standards and are administered by local permitting authorities (i.e., the government entity controlling the publicly-owned treatment works (POTW) to which the industrial wastewater is discharged). The pretreatment standards control pollutants that pass through or interfere with POTWs.

EPA incorporated the following pollution prevention element into all technology options.

- Good Heel Removal and Management Practices. The benefits of good heel removal and management practices include the following:
  - Prevention of pollutants from entering the wastewater stream (i.e., maximum removal of heel prior to tank cleaning minimizes the pollutant loading in the tank interior cleaning wastewater stream);
  - Potential to recover/reuse valuable product; and
  - Reduced wastewater treatment system capital and annual costs due to reduced wastewater pollutant loadings.

The components of good heel removal and management practices are discussed in detail in Section 7.1.2.

Based on responses to the Detailed Questionnaire, the majority of transportation equipment cleaning (TEC) facilities currently operate good heel removal and management practices. Because of the many benefits of these practices, and a demonstrated trend in the TECI to implement these practices, EPA believes that the TECI will have universally implemented good heel removal and management practices prior to implementation of TECI effluent guidelines. Therefore, EPA is allocating no costs or pollutant reductions for this component of the technology option bases.

8.2 Best Practicable Control Technology Currently Available (BPT)

The BPT effluent limitations control identified conventional, priority, and nonconventional pollutants when discharged from TEC facilities to surface waters of the U.S. Generally, EPA determines BPT effluent levels based upon the average of the best existing performances by plants of various sizes, ages, and unit processes within each industrial category or subcategory. In industrial categories where present practices are uniformly inadequate, however, EPA may determine that BPT requires higher levels of control than any currently in place if the technology to achieve those levels can be practicably applied.

In addition, CWA Section 304(b)(1)(B) requires a cost assessment for BPT limitations. In determining the BPT limits, EPA must consider the total cost of treatment technologies in relation to the effluent reduction benefits achieved. This inquiry does not limit EPA's broad discretion to adopt BPT limitations that are achievable with available technology unless the required additional reductions are “wholly out of proportion to the costs of achieving such marginal level of reduction.” See Legislative History, op. cit. p. 170. Moreover, the inquiry does not require the Agency to quantify benefits in monetary terms. See e.g. American Iron and Steel Institute v. EPA, 526 F. 2d 1027 (3rd Cir., 1975).

In balancing costs against the benefits of effluent reduction, EPA considers the volume and nature of expected discharges after application of BPT, the general environmental effects of pollutants, and the cost and economic impacts of the required level of pollution control. In developing guidelines, the CWA does not require or permit consideration of water quality problems attributable to particular point sources, or water quality improvements in particular bodies of water. Therefore, EPA has not considered these factors in developing the final limitations. See Weyerhaeuser Company v. Costle, 590 F. 2d 1011 (D.C. Cir. 1978).

EPA identified relatively few direct discharging facilities for most subcategories in the TECI as compared to the number of indirect discharging facilities. However, the Agency concluded that direct discharging facilities are similar to indirect discharging facilities in terms of types of tanks cleaned, types of commodities cleaned, water use, and wastewater characteristics. With respect to existing end-of-pipe wastewater treatment in place, direct discharging facilities typically operate biological treatment in addition to physical/chemical treatment technologies typically operated by indirect discharging facilities.

8.2.1 BPT Options for the Truck/Chemical & Petroleum Subcategory

BPT options for the Truck/Chemical & Petroleum Subcategory include the following technology bases in addition to good heel removal as discussed in Section 8.1.

Option 1: Equalization, Oil/Water Separation, Chemical Oxidation, Neutralization, Coagulation, Clarification, Biological Treatment, and Sludge Dewatering

Option 2: Equalization, Oil/Water Separation, Chemical Oxidation, Neutralization, Coagulation, Clarification, Biological Treatment, Activated Carbon Adsorption, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 7.3.

Equalization

Purpose: Reduce wastewater variability and accumulate wastewater to optimize subsequent treatment system size and operating costs.

Design Basis: Minimum of 24-hour residence time. Includes aerators/mixers to homogenize wastewater.

Oil/Water Separation

Purpose: Removal of entrained oil and grease.

Design Basis: Vertical tube coalescing separator with rotary oil skimmer. Includes demulsifier chemical additive, oil storage tank, and sludge storage tank.

Chemical Oxidation, Neutralization, Coagulation, and Clarification

Purpose: Chemical Oxidation - chemically oxidize pollutants using oxidants such as hydrogen peroxide.

Neutralization - adjust wastewater pH.

Coagulation - destabilize (reduce repulsive interaction) particle suspension using electrolytes to aggregate suspended matter.

Clarification - settle and remove agglomerated coagulated solids.

Design Basis: Turn-key treatment system consisting of four reaction tanks in series plus a clearwell. Includes chemical feed systems, mixers, control system, and sludge storage tanks.

Biological Treatment

Purpose: Biologically decompose organic constituents.

Design Basis: Activated sludge biological treatment system with a 4.6-day residence time. Includes two preaeration tanks in series and a sludge storage tank.

Activated Carbon Adsorption

Purpose: Wastewater polishing.

Design Basis: Two carbon columns in series with nominal carbon change-out frequency of once per month. Includes carbon charge of 250 lb/gpm/vessel.

Sludge Dewatering

Purpose: Reduce sludge volume by removing water.

Design Basis: Plate-and-frame filter press. Generates dewatered sludge at 32.5% solids.

All existing direct discharging facilities in this subcategory currently employ equalization, coagulation/clarification, biological treatment, and activated carbon adsorption. All existing direct discharging facilities also operate simple oil/water separators, such as gravity separators or oil skimmers, followed by chemical/physical treatment (e.g., coagulation/ clarification).

8.2.2 BPT Options for the Rail/Chemical & Petroleum Subcategory

BPT options for the Rail/Chemical & Petroleum Subcategory include the following technology bases in addition to good heel removal as discussed in Section 8.1.

Option 1: Oil/Water Separation, Equalization, Biological Treatment, and Sludge Dewatering

Option 2: Oil/Water Separation, Equalization, Dissolved Air Flotation (with Flocculation and pH Adjustment), Biological Treatment, and Sludge Dewatering

Option 3: Oil/Water Separation, Equalization, Dissolved Air Flotation (with Flocculation and pH Adjustment), Biological Treatment, Organo-Clay/Activated Carbon Adsorption, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 7.3.

Oil/Water Separation

Purpose: Removal of entrained oil and grease.

Design Basis: API separator with slotted pipe surface oil skimmer, fabric belt skimmer for entrained thin oils, and bottom sludge rake. Includes oil storage tank and sludge storage tank.

Equalization

Purpose: Reduce wastewater variability and accumulate wastewater to optimize subsequent treatment system size and operating costs.

Design Basis: Two tanks in parallel, each with minimum 24-hour residence time. Includes aerators to homogenize wastewater.

Dissolved Air Flotation

Purpose: Removal of entrained solid or liquid particles.

Design Basis: Dissolved air flotation unit with recycle pressurization system. Includes chemical addition systems for polymers (coagulants and flocculant) and pH adjustment, sludge collection tank, and pre-fabricated building.

Biological Treatment

Purpose: Biologically decompose organic constituents.

Design Basis: Activated sludge biological treatment system with a 4.6-day residence time. Includes two preaeration tanks in series and a sludge storage tank.

Organo-Clay/Activated Carbon Adsorption

Purpose: Wastewater polishing.

Design Basis: Two columns in series - organo-clay followed by carbon - with nominal carbon change-out frequency of one vessel per month and nominal organo-clay change-out frequency of one vessel every two months. Includes organo-clay charge of 1.44 ft^3/gpm/vessel and carbon charge of 1.44 ft^3/gpm/vessel.

Sludge Dewatering

Purpose: Reduce sludge volume by removing water.

Design Basis: Plate-and-frame filter press. Generates dewatered sludge at 32.5% solids. Includes sludge storage tank.

All existing direct discharging facilities in this subcategory currently employ equalization, pH adjustment, biological treatment and sludge dewatering. All existing direct discharging facilities also operate simple oil/water separators such as gravity separators or oil skimmers.

8.2.3 BPT Options for the Barge/Chemical & Petroleum Subcategory

BPT options for the Barge/Chemical & Petroleum Subcategory include the following technology bases in addition to good heel removal as discussed in Section 8.1.

Option 1: Oil/Water Separation, Dissolved Air Flotation, Filter Press, Biological Treatment, and Sludge Dewatering

Option 2: Oil/Water Separation, Dissolved Air Flotation, Filter Press, Biological Treatment, Reverse Osmosis, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 7.3.

<u>Oil/Water Separation</u>

Purpose: Removal of low to moderate amounts of insoluble oil.

Design Basis: Gravity separator with 6.4-day residence time for wastewater equalization and oil, water, and solids separation. Includes two separation tanks in series with an oil removal pump and an oil storage tank.

<u>Dissolved Air Flotation</u>

Purpose: Removal of entrained solid or liquid particles.

Design Basis: Dissolved air flotation unit with influent pressurization system. Includes sludge storage tank.

<u>Filter Press</u>

Purpose: Wastewater filtration.

Design Basis: In-line plate-and-frame filter press for wastewater filtration. Generates dewatered sludge at 32.0% solids. Includes diatomaceous earth mix tank and wastewater effluent storage tank.

Biological Treatment

Purpose: Biologically decompose organic constituents.

Design Basis: Activated sludge biological treatment system with a 4.6-day residence time. Includes two preaeration tanks in series, a clarifier with polymer addition for additional solids removal, and a sludge storage tank.

Reverse Osmosis

Purpose: Wastewater polishing.

Design Basis: Reverse osmosis system including unit with membranes, influent wastewater storage tanks, and flooded suction tank.

Sludge Dewatering

Purpose: Reduce biological treatment sludge volume by removing water.

Design Basis: Sludge is dewatered in in-line wastewater plate-and-frame filter press described above.

Note that following the proposed rule, EPA obtained additional treatment performance data for conventional pollutants from two facilities that EPA determined also operated BPT treatment. The technologies operated by these facilities include:

Facility 1: Gravity separation (1.25-day residence time), equalization and solids settling (1.85-day residence time), sand filtration (2-hour residence time), biological treatment with chemically assisted clarification (4-day residence time), and batch flocculation (1.8-day residence time).

Facility 2: Gravity separation (61-day residence time), equalization (30-day residence time), biological treatment with chemically assisted clarification (21-day residence time), and sand filtration (less than 10-minute residence time).

EPA considers the level of pollutant control demonstrated by these facilities to be equivalent to Option 1.

8.2.4 BPT Options for the Food Subcategory

BPT options for the Food Subcategory include the following technology bases in addition to good heel removal as discussed in Section 8.1.

Option 1: Oil/Water Separation

Option 2: Oil/Water Separation, Equalization, Biological Treatment, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 7.3.

<u>Oil/Water Separation</u>

Purpose: Removal of low to moderate amounts of insoluble oil.

Design Basis: Gravity separator with 6.4-day residence time for wastewater equalization and oil, water, and solids separation. Includes two separation tanks in series with an oil removal pump and an oil storage tank.

<u>Equalization</u>

Purpose: Reduce wastewater variability and accumulate wastewater to optimize subsequent treatment system size and operating costs.

Design Basis: Eight-day residence time. Includes aerators/mixers to homogenize wastewater.

<u>Biological Treatment</u>

Purpose: Biologically decompose organic constituents.

Design Basis: Activated sludge biological treatment system with a 4.6-day residence time. Includes two preaeration tanks in series and a sludge storage tank.

Sludge Dewatering

Purpose: Reduce biological treatment sludge volume by removing water.

Design Basis: Plate-and-frame filter press for wastewater filtration. Generates dewatered sludge at 32.0% solids. Includes diatomaceous earth mix tank.

Based on Screener Questionnaire results, EPA estimates that there are 19 direct discharging facilities in the Food Subcategory. However, EPA's survey of the TECI did not identify any direct discharging facilities through the Detailed Questionnaire sample population.

The wastewater generated by the Food Subcategory contains high loadings of biodegradable organics, and few toxic pollutants. EPA conducted sampling at a direct discharging barge/food facility which EPA believes to be representative of the entire subcategory population.

8.2.5 BPT Options for the Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories

BPT options for the Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories include the following technology bases in addition to good heel removal as discussed in Section 8.1.

Option 1: Gravity Separation

The purpose and design bases of the components of this technology option are described below. This technology is also described in further detail in Section 7.3.

Gravity Separation

Purpose: Removal of suspended solids.

Design Basis: Gravity separator with 4-day residence time for wastewater equalization and solids separation. Includes two separation tanks in series.

8.3 Best Conventional Pollutant Control Technology (BCT)

BCT limitations control the discharge of conventional pollutants from direct dischargers. Conventional pollutants include BOD, TSS, oil and grease, and pH. BCT is not an additional limitation, but rather replaces BAT for the control of conventional pollutants. To develop BCT limitations, EPA conducts a cost reasonableness evaluation, which consists of a two-part cost test: 1) the POTW test, and 2) the industry cost-effectiveness test.

In the POTW test, EPA calculates the cost per pound of conventional pollutants removed by industrial dischargers in upgrading from BPT to a BCT candidate technology and then compares this to the cost per pound of conventional pollutants removed in upgrading POTWs from secondary to tertiary treatment. The upgrade cost to industry, which is represented in dollars per pound of conventional pollutants removed, must be less than the POTW benchmark of $0.25 per pound (in 1976 dollars). In the industry cost-effectiveness test, the ratio of the incremental BPT to BCT cost, divided by the BPT cost for the industry, must be less that 1.29 (i.e. the cost increase must be less than 29 percent).

In developing BCT limits, EPA considered whether there are technologies that achieve greater removals of conventional pollutants than for BPT, and whether those technologies are cost-reasonable according to the BCT Cost Test. In each subcategory, EPA considered the same technologies and technology options when developing BCT options as were developed for BPT.

8.4 Best Available Technology Economically Achievable (BAT)

The factors considered in establishing a BAT level of control include: the age of process equipment and facilities, the processes employed, process changes, the engineering aspects of applying various types of control techniques to the costs of applying the control technology, non-water quality environmental impacts such as energy requirements, air pollution and solid waste generation, and such other factors as the Administrator deems appropriate (Section 304(b)(2)(B) of the Act). In general, the BAT technology level represents the best existing economically achievable performance among facilities with shared characteristics. BAT may include process changes or internal plant controls which are not common in the industry. BAT may also be transferred from a different subcategory or industrial category.

In each subcategory, EPA considered the same technologies and technology options when developing BAT options as were developed for BPT.

8.5 New Source Performance Standards (NSPS)

New Source Performance Standards under Section 306 of the CWA represent the greatest degree of effluent reduction achievable through the application of the best available demonstrated control technology for all pollutants (i.e., conventional, nonconventional, and toxic pollutants). NSPS are applicable to new industrial direct discharging facilities. Congress envisioned that new treatment systems could meet tighter controls than existing sources because of the opportunity to incorporate the most efficient processes and treatment systems into plant design. Therefore, Congress directed EPA, in establishing NSPS, to consider the best demonstrated process changes, in-plant controls, operating methods, and end-of-pipe treatment technologies that reduce pollution to the maximum extent feasible.

In each subcategory, EPA considered the same technologies and technology options when developing NSPS options as were developed for BPT.

8.6 Pretreatment Standards for Existing Sources (PSES)

Pretreatment standards are designed to prevent the discharge of toxic pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTWs, as specified in Section 307(b) of the CWA. PSES are technology-based and analogous to BAT limitations for direct dischargers.

8.6.1 PSES Options for the Truck/Chemical & Petroleum Subcategory

PSES options for the Truck/Chemical & Petroleum Subcategory include the following technology bases in addition to good heel removal as discussed in Section 8.1.

Option A: Equalization and Oil/Water Separation

Option 1: Equalization, Oil/Water Separation, Chemical Oxidation, Neutralization, Coagulation, Clarification, and Sludge Dewatering

Option 2: Equalization, Oil/Water Separation, Chemical Oxidation, Neutralization, Coagulation, Clarification, Activated Carbon Adsorption, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 7.3.

Equalization

Purpose: Reduce wastewater variability and accumulate wastewater to optimize subsequent treatment system size and operating costs.

Design Basis: Minimum 24-hour residence time. Includes aerators/mixers to homogenize wastewater.

Oil/Water Separation

Purpose: Removal of entrained oil and grease.

Design Basis: Vertical tube coalescing separator with rotary oil skimmer. Includes demulsifier chemical additive, and oil storage tank.

Chemical Oxidation, Neutralization, Coagulation, and Clarification

Purpose: Chemical Oxidation - chemically oxidize pollutants using oxidants such as hydrogen peroxide.

Neutralization - adjust wastewater pH.

Coagulation - destabilize (reduce repulsive interaction) particle suspension using electrolytes to aggregate suspended matter.

Clarification - settle and remove agglomerated coagulated solids.

Design Basis: Turn-key treatment system consisting of four reaction tanks in series plus a clearwell. Includes chemical feed systems, mixers, control system, and sludge storage tanks.

Carbon Adsorption

Purpose: Wastewater polishing.

Design Basis: Two carbon columns in series with nominal carbon change-out frequency of once per month. Includes carbon charge of 250 lb/gpm/vessel.

Sludge Dewatering

Purpose: Reduce sludge volume by removing water.

Design Basis: Plate-and-frame filter press. Generates dewatered sludge at 32.5% solids.

8.6.2 PSES Options for the Rail/Chemical & Petroleum Subcategory

PSES options for the Rail/Chemical & Petroleum Subcategory include the following technology bases in addition to good heel removal as discussed in Section 8.1.

Option 1: Oil/Water Separation

Option 2: Oil/Water Separation, Equalization, Dissolved Air Flotation (with Flocculation and pH Adjustment), and Sludge Dewatering

Option 3: Oil/Water Separation, Equalization, Dissolved Air Flotation (with Flocculation and pH Adjustment), Organo-Clay/Activated Carbon Adsorption, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 7.3.

Oil/Water Separation

Purpose: Removal of entrained oil and grease.

Design Basis: API separator with slotted pipe surface oil skimmer, fabric belt skimmer for entrained thin oils, and bottom sludge rake. Includes oil storage tank and sludge storage tank.

Equalization

Purpose: Reduce wastewater variability and accumulate wastewater to optimize subsequent treatment system size and operating costs.

Design Basis: Two tanks in parallel, each with minimum 24-hour residence time. Includes aerators to homogenize wastewater.

Dissolved Air Flotation

Purpose: Removal of entrained solid or liquid particles.

Design Basis: Dissolved air flotation unit with recycle pressurization system. Includes chemical addition systems for polymers (coagulants and flocculant) and pH adjustment, sludge collection tank, and pre-fabricated building.

Organo-Clay/Activated Carbon Adsorption

Purpose: Wastewater polishing.

Design Basis: Two columns in series - organo-clay followed by carbon - with nominal carbon change-out frequency of one vessel per month and nominal organo-clay change-out frequency of one vessel every two months. Includes organo-clay charge of 1.44 ft^3/gpm/vessel and carbon charge of 1.44 ft^3/gpm/vessel.

Sludge Dewatering

Purpose: Reduce sludge volume by removing water.

Design Basis: Plate-and-frame filter press. Generates dewatered sludge at 32.5% solids. Includes sludge storage tank.

8.6.3 PSES Options for the Barge/Chemical & Petroleum Subcategory

PSES options for the Barge/Chemical & Petroleum Subcategory include the following technology bases in addition to good heel removal as discussed in Section 8.1.

Option 1: Oil/Water Separation, Dissolved Air Flotation, and Filter Press

Option 2: Oil/Water Separation, Dissolved Air Flotation, Filter Press, Biological Treatment, and Sludge Dewatering

Option 3: Oil/Water Separation, Dissolved Air Flotation, Filter Press, Biological Treatment, Reverse Osmosis, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 7.3.

<u>Oil/Water Separation</u>

Purpose: Removal of low to moderate amounts of insoluble oil.

Design Basis: Gravity separator with 6.4-day residence time for wastewater equalization and oil, water, and solids preparation. Includes two separation tanks in series with an oil removal pump and an oil storage tank.

<u>Dissolved Air Flotation</u>

Purpose: Removal of entrailed solid or liquid particles.

Design Basis: Dissolved air flotation unit with influent pressurization system. Includes sludge storage tank.

<u>Filter Press</u>

Purpose: Wastewater filtration.

Design Basis: In-line plate-and-frame filter press for wastewater filtration. Generates dewatered sludge at 32.0% solids. Includes diatomaceous earth mix tank and wastewater effluent storage tank.

Biological Treatment

Purpose: Biologically decompose organic constituents.

Design Basis: Activated sludge biological treatment system with a 4.6-day residence time. Includes two preaeration tanks in series, a clarifier with polymer addition for additional solids removal, and a sludge storage tank.

Reverse Osmosis

Purpose: Wastewater polishing.

Design Basis: Reverse osmosis system including unit with membranes, influent wastewater storage tanks, and flooded suction tank.

Sludge Dewatering

Purpose: Reduce biological treatment sludge volume by removing water.

Design Basis: Sludge is dewatered in in-line wastewater plate-and-frame filter press described above.

8.6.4 PSES Options for the Food Subcategory

PSES options for the Food Subcategory include the following technology bases in addition to good heel removal as discussed in Section 8.1.

Option 1: Oil/Water Separation

Option 2: Oil/Water Separation, Equalization, Biological Treatment, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 7.3.

Oil/Water Separation

Purpose: Removal of low to moderate amounts of insoluble oil.

Design Basis: Gravity separator with 6.4-day residence time for wastewater equalization and oil, water, and solids separation. Includes two separation tanks in series with an oil removal pump and an oil storage tank.

Equalization

Purpose: Reduce wastewater variability and accumulate wastewater to optimize subsequent treatment system size and operating costs.

Design Basis: Eight-day residence time. Includes aerators/mixers to homogenize wastewater.

Biological Treatment

Purpose: Biologically decompose organic constituents.

Design Basis: Activated sludge biological treatment system with a 4.6-day residence time. Includes two preaeration tanks in series and a sludge storage tank.

Sludge Dewatering

Purpose: Reduce biological treatment sludge volume by removing water.

Design Basis: Plate-and-frame filter press for wastewater filtration. Generates dewatered sludge at 32.0% solids. Includes diatomaceous earth mix tank.

8.6.5 PSES Options for the Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories

PSES options for the Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories include the following technology bases in addition to good heel removal as discussed in Section 8.1.

Option 1: Gravity Separation

The purpose and design bases of the components of this technology option are described below. This technology is also described in further detail in Section 7.3.

Gravity Separation

Purpose: Removal of suspended solids.

Design Basis: Gravity separator with 4-day residence time for wastewater equalization and solids separation. Includes two separation tanks in series.

8.6.6 Pollution Prevention Alternative

EPA also considered an enforceable pollution prevention alternative, referred to as the Pollutants Management Plan. The ten components of this plan include:

(i) procedures for identifying cargos, the cleaning of which is likely to result in discharges of pollutants that would be incompatible with treatment at the POTW;

(ii) for cargos identified as being incompatible with treament at the POTW, the plan shall provide that heels be fully drained, segregated from other wastewaters, and handled in an appropriate manner;

(iii) for cargos identified as being incompatible with treatment at the POTW, the Plan shall provide that the tank be prerinsed or presteamed as appropriate and the wastewater segregated from wastewaters to be discharged to the POTW and handled in an appropriate manner, where necessary to ensure that they do not cause or contribute to a discharge that would be incompatible with treatment at the POTW;

(iv) all spent cleaning solutions, including interior caustic washes, interior presolve washes, interior detergent washes, interior acid washes, and exterior acid brightener washes shall be segregated from other wastewaters and handled in an appropriate manner, where necessary to ensure that they do not cause or contribute to a discharge that would be incompatible with treatment at the POTW;

(v) provisions for appropriate recycling or reuse of cleaning agents;

(vi) provisions for minimizing the use of toxic cleaning agents (solvents, detergents, or other cleaning or brightening solutions);

(vii) provisions for appropriate recycling or reuse of segregated wastewaters (including heels and prerinse/pre-steam wastes);

(viii) provisions for off-site treatment or disposal, or effective pre-treatment of segregated wastewaters (including heels, prerinse/pre-steam wastes, spent cleaning solutions);

(ix) information on the volumes, content, and chemical characteristics of cleaning agents used in cleaning or brightening operations; and

(x) provisions for maintaining appropriate records of heel management procedures, prerinse/pre-steam management procedures, cleaning agent management procedures, operator training, and proper operation and maintenance of any pre-treatment system.

8.7 Pretreatment Standards for New Sources (PSNS)

Section 307 of the CWA requires EPA to promulgate both pretreatment standards for new sources and new source performance standards. New indirect discharging facilities, like new direct discharging facilities, have the opportunity to incorporate the best available demonstrated technologies including: process changes, in-facility controls, and end-of-pipe treatment technologies.

In each subcategory, EPA considered the same technologies and technology options when developing PSNS options as were developed for PSES.

9.0 COSTS OF TECHNOLOGY BASES FOR REGULATIONS

This section describes the methodology used to estimate the implementation costs associated with each of the regulatory options under consideration for the Transportation Equipment Cleaning Industry (TECI). Section 8.0 describes in detail the regulatory options and the technologies used as the bases for those options. The cost estimates presented in this section, together with the pollutant reduction estimates described in Section 10.0, provide a basis for evaluating the regulatory options and determining the economic impact of the final regulation on the TECI. The results of the economic impact assessment for the regulation are found in the Economic Assessment (EA) for the TECI final rulemaking (1).

EPA used the following approach to estimate compliance costs for the TECI:

- EPA mailed Detailed Questionnaires to a statistical sample of transportation equipment cleaning (TEC) facilities (discussed in Section 3.2.3). Information from the 81 facilities that responded to the questionnaire was used to characterize industry-wide TEC operations, operating status, and pollutant control technologies in place for the baseline year (1994). EPA also used information from Screener Questionnaire responses (discussed in Section 3.2.2) and other sources for four direct discharging facilities to characterize the baseline for direct dischargers in two industry subcategories (see Section 9.1.2).

- EPA collected and analyzed field sampling data to determine the pollutant concentrations in untreated TEC-process wastewater (discussed in Section 6.0).

- EPA identified candidate pollution prevention and wastewater treatment technologies and grouped appropriate technologies into regulatory options (discussed in Section 8.0). The regulatory options serve as the bases of compliance cost and pollutant loading calculations.

- EPA performed sampling episodes at best performing facilities to determine pollutant removal performance for the identified technologies (see Section 10.0).

- EPA developed cost equations for capital and operating and maintenance (O&M) costs for water conservation practices (discussed in Section 9.2.7) and each technology included in the regulatory options (discussed in Section 9.2.4) based on information gathered from TEC facilities, wastewater treatment system vendors, technical literature, and on engineering judgement.

- EPA developed and used an electronic cost model to estimate compliance costs (discussed in Section 9.3) and pollutant loadings (discussed in Section 10.0) for each regulatory option.

- EPA used output from the cost model to estimate total annualized costs, cost-effectiveness values, and the economic impact of each regulatory option on the TECI (presented in the EA).

EPA estimated facility compliance costs for 19 unique technology options. Table 9-1 at the end of this section lists the number of technology options for which EPA estimated facility compliance costs.

The following information is discussed in this section:

- Section 9.1: Development of model sites;
- Section 9.2: Methodology used to estimate compliance costs;
- Section 9.3: Design and cost elements for pollutant control technologies;
- Section 9.4: Summary of estimated compliance costs by regulatory option; and
- Section 9.5: References.

EPA also evaluated a pollution prevention alternative as discussed in Section 8.6.6. Because EPA is considering the pollution prevention plan as an alternative to meeting the numeric standards, EPA believes that the costs of this plan will be less than the costs of any of EPA's selected options because a facility will choose to adopt the most cost effective option available to it.

9.1 Development of Cost Model Inputs

This section describes the development of the key inputs to the TECI cost model: model sites and pollutant control technologies.

9.1.1 Model Site Development

The Agency used a model site approach to estimate regulatory compliance costs for the TECI. A model site is an operating TEC facility whose data were used as input to the TECI cost model. A total of 81 facilities were used as model sites for the cost analysis because each meets the following criteria:

- The facility discharges 100,000 gallons or more per year of TEC process wastewater either directly to surface waters or indirectly to a publicly-owned treatment works (POTW); and
- The facility supplied sufficient economic and technical data to estimate compliance costs and assess the economic impacts of these costs. Such data include daily flow rate, operating schedules, tank cleaning production and types of tanks cleaned, existing treatment in place, and economic status for the base year 1994.

As discussed in Section 3.2.3, EPA mailed Detailed Questionnaires to a statistical sample of TEC facilities. EPA evaluated each of the 176 respondents to determine whether the facility would be potentially affected by the regulatory options considered by the Agency and would therefore incur costs as a result of potential regulations. Ninety-five facilities would not incur costs because:

- The facility is subject to other Clean Water Act final or proposed categorical standards and, therefore, meets EPA's exclusion for industrial and commercial facilities (34 facilities);
- The facility discharges less than 100,000 gallons per year of TEC process wastewater (12 facilities); or

- The facility is a zero or alternative discharging facility (i.e., does not discharge TEC wastewater either directly or indirectly to a surface water) and thus would not be subject to the limitations and standards for this guideline (49 facilities).

Each of the 81 facilities is considered a “model” facility since it represents a larger number of facilities in the overall industry population as determined by its statistical survey weight. The Statistical Support Document (2) discusses in detail the development of the survey weights. These facilities represent an estimated industry population of 692 facilities that discharge either directly to surface waters or indirectly to a POTW. EPA selected a facility-by-facility model approach to estimate compliance costs, as opposed to a more general modeling approach, to better characterize the variability of processes and resultant wastewaters among TEC facilities.

Although EPA estimated regulatory compliance costs on a facility-by-facility basis, EPA made certain engineering assumptions based on information from standard engineering costing publications, equipment vendors, and industry-wide data. Thus, for any given model facility (or facilities represented by the model facility), the estimated costs may deviate from those that the facility would actually incur. However, EPA considers the compliance costs to be accurate when evaluated on an industry-wide, aggregate basis.

9.1.2 Supplemental Model Site Development

EPA reviewed the 81 model facilities and identified direct dischargers in two subcategories (Barge/Chemical & Petroleum and Barge/Hopper), but none in the remaining subcategories. To assess the need to develop limitations and standards for direct dischargers for the remaining subcategories, EPA reviewed the Screener Questionnaire sample population to identify direct discharging facilities that would be subject to these regulations. This review identified the following direct dischargers by subcategory:

- Truck/Chemical & Petroleum (three facilities in sample population);
- Rail/Chemical & Petroleum (one facility in sample population); and

- Food (three facilities in sample population).

EPA decided to estimate compliance costs for direct dischargers in the Truck/Chemical & Petroleum and Rail/Chemical & Petroleum Subcategories for the following reasons:

- Regulatory options considered for direct and indirect dischargers differ (i.e., regulatory options for direct dischargers include biological treatment while those for indirect dischargers do not); and

- Dissimilar regulatory options may result in significantly different estimated compliance costs.

Technical information required to estimate compliance costs for these facilities was obtained from the Screener Questionnaire responses, telephone conversations with facility personnel, and facility NPDES permits.

Note that the estimated compliance costs for these direct dischargers are not added to the costs estimated for the 81 model sites (described in Section 9.1) to obtain industry-wide cost estimates. Statistically, compliance costs for these direct dischargers are included within the industry-wide cost estimates based on the 81 model facilities. Therefore, EPA used estimated compliance costs for these direct dischargers only to assess in greater detail the impact of the limitations on these facilities.

EPA estimates that the compliance costs for direct dischargers in the Food Subcategory will be zero or insignificant for the following reasons:

- All of these facilities identified by EPA currently operate biological treatment and are believed to currently achieve the final limitations; and

- EPA assumes that current NPDES permits for these facilities require frequent monitoring for pollutant parameters regulated by this guideline (i.e., BOD_5, TSS, and oil and grease). Therefore, these facilities will not incur additional monitoring costs as a result of this rulemaking.

Based on this assessment, EPA believes that developing model sites in the TECI cost model for direct discharging food grade facilities is not necessary.

9.1.3 Pollutant Control Technology Development

EPA evaluated Screener and Detailed Questionnaire responses to identify applicable pollution prevention and wastewater treatment technologies for the TECI and to select facilities for EPA's TECI site visit and sampling program. EPA conducted 44 engineering site visits at 43 facilities to collect information about TEC processes, water use practices, pollution prevention practices, wastewater treatment technologies, and waste disposal methods. Based on the information gathered from these site visits, EPA sampled untreated and/or treated wastewater streams at 18 facilities. EPA also collected treatment performance data from two additional Barge/Chemical & Petroleum facilities operating BAT/BPT treatment (see Section 3.5). Sections 3.3 and 3.4 discuss in more detail the engineering site visit and sampling program conducted as part of the TECI rulemaking.

In most cases, the specific pollutant control technologies costed, including equipment, chemical additives and dosage rates, and other O&M components, are the same as those operated by the facilities whose sampling data are used to represent the performance options, with adjustments made to reflect differences in wastewater flow rates or other facility-specific conditions. For example, BPT and PSES Options 1 and 2 for the Truck/Chemical & Petroleum Subcategory include chemical oxidation, neutralization, coagulation, and clarification and are specifically based on a turn-key system characterized during wastewater sampling. Therefore, EPA's estimated compliance costs are based upon implementation of a turn-key chemical oxidation, neutralization, coagulation, clarification system. EPA chose this approach to ensure that the technology bases of the regulatory options can achieve the limitations and standards, and that the estimated compliance costs reflect implementation of these technology bases. EPA believes this approach overestimates the compliance costs because many facilities can likely achieve the limitations and standards by implementing less expensive pollution prevention practices, substituting less expensive alternative equipment, or utilizing equipment in place that EPA did not assess as equivalent to the technology basis (see Section 9.2.5 for more detail on treatment-in-place credits).

EPA emphasizes that the regulations do not require that a facility install or possess these technologies, but only that the facility comply with the appropriate effluent limitations and standards.

9.1.4 Model Sites with Production in Multiple Subcategories

Some model facilities have production in more than one subcategory. For example, a facility that cleans both tank trucks and rail tank cars that last transported chemical cargos has production in both the Truck/Chemical & Petroleum and Rail/Chemical & Petroleum Subcategories. To simplify compliance costs and pollutant reduction estimates, EPA assigned each multiple-subcategory facility a primary subcategory. For these facilities, compliance costs and pollutant reduction estimates for all facility production are assigned to the primary subcategory. This methodology may bias the subcategory cost and pollutant reduction estimates on a facility-by-facility basis; however, EPA believes that subcategory costs and pollutant reduction estimates are accurate on an aggregate basis (i.e., individual facility biases are offset within each subcategory in aggregate).

This simplification is necessary because the technology bases of the regulatory options differ for each subcategory. EPA considered an alternative approach that included designing separate treatment systems for subcategory-specific wastewater based on the subcategory regulatory options. However, to comply with the regulations, a facility can implement any technology it chooses, provided it achieves the effluent limitations. Installation of two (or more) separate treatment systems is not a practical or cost-effective solution to comply with the regulations. Therefore, EPA rejected this alternative approach.

Compliance costs and pollutant reduction estimates for individual facilities that clean multiple tank types are based on the assumption that facilities will install and operate the technologies chosen as the technology basis for each facility's primary subcategory. EPA does not have data available demonstrating that the technologies costed to treat each primary subcategory will effectively treat wastewaters from all potential secondary subcategories. For example, EPA does not have data available on the performance of the Truck/Chemical & Petroleum Subcategory technology bases in treating Rail/Chemical & Petroleum Subcategory wastewater. However, EPA believes that the costed technology for the Truck/Chemical & Petroleum Subcategory option will control all pollutants of interest in all TEC wastewaters generated by each facility because the control technologies included in the different technology bases use similar pollutant removal mechanisms (e.g., chemical/physical treatment, secondary biological treatment, and advanced treatment for wastewater polishing).

For these reasons, EPA believes that its costing methodology for multiple-subcategory facilities is appropriate and adequately represents the compliance costs and pollutant reductions for these facilities.

9.2 Costing Methodology

To accurately determine the impact of the effluent limitations guidelines and standards on the TECI, EPA estimated costs associated with regulatory compliance. The Agency developed a cost model to estimate compliance costs for each of the regulatory options under BPT, BCT, BAT, PSES, PSNS, and NSPS. EPA, used the cost model to estimate costs associated with implementation of the pollutant control technologies used as the basis for each option. However, EPA did not use the cost model to estimate compliance costs for the Barge/Chemical & Petroleum Subcategory, rather EPA used a site-specific approach to assign compliance costs (see Section 9.2.9). Again, the regulations do not require that a facility install and possess these technologies but only that the appropriate facility effluent limitations and standards be achieved.

In addition, EPA included water conservation in its costing methodology. Although water conservation technologies are not included in EPA's technology options, EPA retained these technologies as a cost-effective compliance strategy for several subcategories (see Section 9.2.7).

9.2.1 Wastewater Streams Costed

Based on information provided by the sites in their Detailed Questionnaire (or Screener Questionnaire in the case of the four direct dischargers without a Detailed Questionnaire), follow-up letters, and telephone calls, EPA classified each wastewater stream at each site as TEC interior cleaning wastewater, other TEC commingled wastewater stream, or non-TEC wastewater. The following additional questionnaire data were used to characterize wastewater streams:

- Flow rate;
- Production rate (i.e., types and number of tanks cleaned); and
- Operating schedule.

EPA first reviewed wastewater streams discharged by each facility and classified these streams as interior cleaning wastewater or other commingled wastewater stream. Facilities that clean tanks representing multiple modes of transportation (e.g., road, rail, or waterway) or that clean both tanks and closed-top hoppers are considered to have multiple wastewater streams. However, as discussed in Section 9.1.4, these facilities are assigned a primary subcategory, and the TECI cost model costs the flow contribution of wastewater from any secondary subcategory as primary subcategory wastewater.

Wastewater considered in developing compliance costs consists of tank interior cleaning wastewater and other commingled wastewater streams not easily segregated. Examples of interior cleaning wastewater are water, condensed steam, prerinse cleaning solutions, chemical cleaning solutions, and final rinse solutions generated from cleaning tank and container interiors. Examples of other commingled waste streams not easily segregated are tank or trailer exterior cleaning wastewater, equipment and floor washings, TEC-contaminated stormwater, boiler blowdown, bilge and ballast waters, and other non-TEC wastewater streams that are commingled with TEC wastewaters. Incidental and non-TEC wastewater streams are included in developing the compliance costs because these streams are difficult or costly to segregate and treat separately from TEC wastewater.

Wastewater streams not considered in developing compliance costs include sanitary wastewater; tank hydrotesting wastewater; and repair, rebuilding, and maintenance wastewater. These wastewater streams are not costed for treatment because they do not fall within the scope of the TECI rulemaking (e.g., they fall under the scope of another rulemaking) and they are generally easily segregated from TEC wastewaters.

9.2.2 Influent Pollutant Concentrations

The concentration of each pollutant in each model site TEC wastewater stream was estimated using field sampling pollutant loadings data for wastewater discharged by tank type. Section 3.4 discusses the field sampling program. These data are used with Detailed or Screener Questionnaire flow, tank cleaning production, and operating data to calculate the influent concentrations. Section 10.0 describes these calculations in more detail.

9.2.3 Cost Model Development

EPA developed a computerized design and cost model to estimate compliance costs and pollutant reductions for the TECI technology options for the following subcategories:

- Truck/Chemical & Petroleum;
- Rail/Chemical & Petroleum;
- Barge/Chemical & Petroleum (indirect dischargers only);
- Food;
- Truck/Hopper;
- Rail/Hopper; and
- Barge/Hopper.

(The costing methodology developed for direct dischargers in the Barge/Chemical & Petroleum Subcategory is discussed in Section 9.2.9.)

EPA evaluated the following existing cost models from other EPA effluent guidelines development efforts to be used as the basis for the TECI cost model:

- Metal Products and Machinery (MP&M) Phase I Industries Design and Cost Model; and

- Pharmaceuticals Industry Cost Model.

EPA incorporated modified components of both models in the TECI cost model.

The TECI cost model contains technology "modules," or subroutines; each module calculates direct capital and annual costs for installing and operating a particular wastewater treatment or pollution reduction technology. In general, each module is exclusive to one control technology. For each regulatory option, the TECI cost model combines a series of technology modules. There are also module-specific "drivers" (technology drivers) that operate in conjunction with the technology modules. These drivers access input data, run the corresponding modules, and populate output databases. The technology drivers are bound together by primary drivers, which run the technology drivers in the appropriate order for each regulatory option.

EPA adapted the MP&M cost model drivers for the TECI cost model with the following modifications:

- Costs are tracked by subcategory. The MP&M cost model was not designed to develop separate costs and loads by subcategory.

- All data values calculated by the cost model are stored in an output database file. This allows the cost model user to examine the importance of each calculated value for each technology module.

The input data to the cost model include production data (i.e., types and number of tanks cleaned), wastewater flow, existing technology in place, operational hours per day, and operational days per year. EPA obtained the flow rates, operating schedules, production data, and existing treatment-in-place data from Detailed Questionnaire responses from each facility (and other data sources for supplemental facilities, as discussed in Section 9.1.2). These data comprise the input data for the technology modules. Each module manipulates the input data (stored in data storage files) to generate output data (stored in different data storage files), which represent costs incurred by implementing the costed technology. The output data storage files become the input data storage files for subsequent technology modules, enabling the cost model to track operating hours per day and days per year, flows, and costs for use in subsequent modules.

9.2.4 Components of Compliance Costs

EPA used the TECI cost model to calculate capital costs and annual O&M costs for each technology and to sum the capital and O&M costs for all technologies at each facility. Capital costs comprise direct and indirect costs associated with the purchase, delivery, and installation of pollutant control technologies. Annual O&M costs comprise all costs related to operating and maintaining the treatment system for a period of one year, including the estimated costs for compliance monitoring of wastewater discharges. These compliance costs components are described in detail in the following subsections.

9.2.4.1 Capital Costs

The TECI cost model uses the cost equations listed in Table 9-2 to estimate the direct capital costs for purchasing, delivering, and installing equipment included in the technology bases for each regulatory option. Where possible, cost sources (i.e., vendors) provide all three cost components for varying sized equipment. Where a vendor quote is not available, literary references or estimates based on engineering judgement are used to estimate direct capital cost. Direct capital costs consist of the following:

- Purchase of treatment equipment and any accessories;
- Purchase of treatment equipment instrumentation (e.g., pH probes and control systems);
- Installation costs (e.g., labor and rental fees for equipment such as cranes);
- Delivery cost based on transporting the treatment system an average of 500 miles;
- Construction of buildings or other structures to house major treatment units (e.g., foundation slab, enclosure, containment, and lighting and electricity hook-ups); and
- Purchase of necessary pumps (e.g., for wastewater transfer, chemical addition, and sludge handling).

Indirect capital costs are not technology-specific and are instead represented as a factor that is applied to the direct capital costs in the post-processing portions of the TECI cost model. Indirect capital costs typically include the following:

- Purchase and installation of necessary piping to interconnect treatment system units (e.g., pipe, pipe hangers, fittings, valves, insulation, similar equipment);
- Secondary containment and land costs;
- Excavation and site work (e.g., site clearing, landscaping, fences, walkways, roads, parking areas);
- Engineering costs (e.g., administrative, process design and general engineering, communications, consultant fees, legal fees, travel, supervision, and inspection of installed equipment);
- Construction expenses (e.g., construction tools and equipment, construction supervision, permits, taxes, insurance, interest);
- Contractors' fees; and
- Contingency (e.g., allocation for unpredictable events such as foul weather, price changes, small design changes, and errors in estimates).

Total capital investment (direct and indirect capital costs) is obtained by multiplying the direct capital cost by various indirect capital cost factors, summing them, and then adding start-up costs as shown in Table 9-3.

Capital cost equations relate direct capital cost to equipment design parameters, such as wastewater flow. Equipment component designs are generally based upon the equipment operated by the facilities whose sampling data are used as the basis for the technology options. To relate the design of the equipment operated by the sampled facility to that required by the costed facilities, the TECI cost model typically uses a “design equation.” For example, a sampled facility with a nominal wastewater flow rate of 50 gpm operates a 65-gpm dissolved air flotation (DAF) unit. The design equation developed for the DAF unit is:

$$\mathrm{DAFGPM} = \mathrm{INFGPM} \times \left(\frac{65}{50}\right) = \mathrm{INFGPM} \times 1.3 \qquad (1)$$

where:

DAFGPM	=	DAF unit nominal capacity (gpm)
INFGPM	=	Influent flow rate (gpm)

In this example, the equipment design parameter for the DAF unit is the facility’s wastewater flow rate, and the equipment costing parameter is the DAF unit’s nominal capacity.

Cost equations are used throughout the TECI cost model to determine direct capital costs. For a given equipment component, a cost curve is developed by plotting different equipment sizes versus direct capital costs. Equipment sizes used to develop the cost equations correspond to the range of sizes required by the costed facilities based on an influent flow rate or volume requirement. The cost/size data point pairs are plotted and an equation for the curve that provides the best curve fit for the plotted points with the least standard error is calculated. The equations calculated to fit the cost curves are most commonly polynomial, but may be linear, exponential, or logarithmic.

Because of the variability in wastewater flow rates at TEC facilities, equipment design equations estimate that some facilities would require very small pieces of equipment. In some instances, EPA determined that very small equipment is either not commercially available or not technically feasible. In these cases, the facility is costed for the smallest equipment size that is both commercially available and technically feasible. For wastewater streams requiring equipment with a capacity above the maximum-sized unit commercially available and technically feasible, multiple units of equal capacity are designed to operate in parallel.

9.2.4.2 Annual Costs

Annual cost components include costs for operational labor, maintenance and repair labor, operating and maintenance materials, electricity, treatment chemicals, filter replacements, disposal of treatment system residuals, and monitoring.

Annual costs typically are not estimated using cost curves. Operational, maintenance, and repair labor are estimated as a labor time requirement per equipment component or a fraction of the total operational hours per day and operational days per year for the costed facility. Labor time is converted to a constant labor cost used throughout the TECI cost model. The TECI cost model uses the wage rate specified in The Richardson Rapid System Process Plant Construction Estimating Standards (3) for installation workers in 1994 ($25.90 per hour) for all required labor to install, operate, and maintain the systems associated with the technology bases. Electricity costs are based on operating time and required horsepower, which are converted to electricity costs using a standard rate used throughout the TECI cost model. The TECI cost model uses the average cost for electricity of $0.047 per KW-hr from the MP&M cost model (4). Chemical addition feed rates, filter replacements, and wastewater treatment residual generation rates are generally based on wastewater flow rate. These rates are converted to costs using unit cost data (e.g., $/weight) provided by chemical vendors and waste disposal facilities. The TECI cost model uses water rates from the 1992 Rate Survey of Water and Wastewater conducted by Ernst and Young (5). The water rate is adjusted from the 1992 rate of $2.90 per 1,000 gallons to the 1994 rate of $2.98 per 1,000 gallons using the capital investment index discussed later in this section.

Table 9-4 presents the O&M unit costs used by the cost model and includes references for the origin of each cost.

EPA adjusted water fees and monitoring costs calculated by the cost model to 1994 dollars because all facility-specific information in the questionnaire database is from 1994. This adjustment allows direct comparison between financial data reported in the Detailed Questionnaire and calculated compliance costs for each facility. Costs are adjusted based on the Chemical Engineering (CE) Plant Cost 1994 annual index and the index value for the year in which costs were originally reported using the following formula (6):

$$AC = OC \left(\frac{368.1}{OCI} \right) \tag{2}$$

where:

AC	=	Adjusted cost, 1994 dollars
OC	=	Original cost, dollars
OCI	=	Original cost year index

9.2.5 Treatment-in-Place Credit

EPA evaluated facility responses to the Detailed Questionnaire to determine whether pollutant control technologies are currently in place. These facilities are given credit for having “treatment in place” to ensure that EPA accurately assesses the baseline (1994) costs and pollutant loadings. Where appropriate, these treatment credits are used to develop cost estimates for system upgrades instead of costing for new systems. No costs beyond necessary additional compliance monitoring are estimated for facilities currently using pollutant control technologies with sufficient capacity equivalent to a regulatory option.

EPA reviewed questionnaire data for each model facility to assess the types of end-of-pipe technologies in place at each site (e.g., oil/water separation, biological oxidation). EPA identified end-of-pipe technologies on site that, based on technical consideration, are considered equivalent to technologies included in the TECI technology options. For example, belt filter presses are considered equivalent to plate-and-frame filter presses for sludge dewatering. EPA also identified technologies that are not considered equivalent, and for which no credit for treatment in place is given. For example, bag filters are not considered equivalent to activated carbon adsorption. Site-specific determinations regarding treatment in place at model sites are included in the administrative record for this rulemaking.

In some cases, EPA evaluated facility treatment-in-place to determine whether existing technologies, although not identical to EPA's technology bases, may be sufficient to meet EPA's effluent limitations. For example, Option 1 for the Truck/Chemical & Petroleum Subcategory includes oil/water separation (coalescing-type) and chemical/physical treatment (coagulation/clarification). Several model facilities currently operate simple oil/water separators such as gravity separators or oil skimmers, followed by chemical/physical treatment (coagulation or dissolved air flotation). EPA believes both treatment approaches can achieve equivalent performance; therefore, the Agency assessed treatment-in-place credit for these facilities. This belief is based on two assumptions. First, EPA assumes that facilities are operating oil/water separation technologies that are appropriate for the specific amount and type of oils and greases generated by their facility. Second, EPA assumes that subsequent chemical/physical treatment will be adequate to handle any minor aberrations in anticipated oil and grease characteristics. EPA used this same approach for assigning oil/water separation (API) treatment-in-place credit for the Rail/Chemical & Petroleum Subcategory.

EPA used operating schedule data and site-specific technology specifications from the Detailed Questionnaire responses to assess the capacity of the end-of-pipe technologies in place at the model sites. EPA assumed that each model site operates the technologies in place at full capacity at baseline (i.e., currently). Therefore, EPA used the operating schedule and capacity of each technology as reported in the questionnaire to define its maximum operating capacity.

EPA uses the maximum operating capacity to assign facilities full or partial treatment-in-place credit. Partial treatment-in-place credit is assigned to facilities determined to not have enough treatment capacity in place.

Facilities receiving full treatment-in-place credit for a given technology are not expected to incur additional capital or O&M costs. However, the facility may incur additional costs for items not directly associated with the unit, such as monitoring costs. Facilities receiving partial treatment-in-place credit incur additional capital and O&M costs under the regulatory options for an additional unit to treat the wastewater flow that is above the existing unit's capacity.

EPA also analyzed technologies that are not considered equivalent, and for which no credit for treatment in place is given, to see if these facilities currently generate significant volumes of settled sludge that are disposed off site. Although operation of these units is not considered equivalent treatment, the sludge currently generated by these units is considered similar to the sludge that would be generated by the technology bases if the non-equivalent technology were not operated. If these treatment units continue to be operated after implementation of the technology bases, they will significantly reduce the amount of sludge that would be generated by the technology bases. Therefore, EPA credited baseline sludge generation and disposal from non-equivalent equipment.

9.2.6 Calculation of Baseline Parameters

As discussed in the previous section, EPA determined the treatment in place for the costed facilities. Before running the cost model for any of the technology options, a baseline run of the model is performed to determine the following:

- Baseline (1994) annual costs incurred by each model site;
- Baseline non-water quality impacts, such as electricity usage, sludge and solid waste generation, and waste oil generation; and

- Baseline pollutant loadings.

The baseline values for annual costs, non-water quality impacts, and pollutant loadings are subtracted from the costs calculated for each technology option to estimate the incremental costs of compliance with each regulatory option. EPA uses the incremental costs, non-water quality impacts, and pollutant loadings to represent economic and environmental impacts of the rulemaking.

9.2.7 Good Water Conservation Practices and Flow Reduction

As discussed in Section 7.2, the reduction in the volume of wastewater discharged from TEC facilities offers several benefits, including the following:

- Reduced water usage and sewage fees;
- Improved wastewater treatment efficiency because influent wastewater pollutant concentrations will be higher; and
- Reduced wastewater treatment system capital and annual operating and maintenance (O&M) costs due to reduced wastewater flows.

End-of-pipe wastewater treatment cannot achieve complete removal of pollutants. There is a lowest concentration that wastewater treatment technologies have been demonstrated to achieve. As shown in the equation below, pollutant loadings in wastewater are dependent upon wastewater pollutant concentration and on wastewater flow.

$$PNPL = \frac{C \times PNF}{264{,}170} \qquad (3)$$

where:

PNPL = Production normalized pollutant load, g/tank
C = Concentration, µg/L
PNF = Production normalized flow, gallons/tank

Equation (3) demonstrates that optimal pollutant reductions are achieved using a combination of good water conservation practices and end-of-pipe wastewater treatment.

In developing effluent guidelines limitations and standards for the TECI, EPA included good water conservation practices as a cost-effective compliance strategy for most subcategories. Although EPA did not include flow reduction in the technology bases for all subcategories, EPA retained flow reduction in the cost model for most subcategories. Flow reduction results in significant compliance cost savings and consequently EPA assumed facilities will incorporate flow reduction in their compliance strategy.

The Agency considered good water conservation practices to be represented by the median tank interior cleaning wastewater volume discharged per tank cleaning (including non-TEC wastewater streams not easily segregated) for each facility type. This wastewater volume is referred to as the "target flow" for each facility type. Table 9-5 presents target flows for existing facilities by facility type. Development of the target flows is described in Section 9.2.7.2.

EPA did not include water conservation practices as a costing strategy for the Barge/Chemical & Petroleum Subcategory because of the high variability in wastewater volumes required for barge cleaning. For example, tanks with an interior frame require more water to clean, and some barges are only cleaned every few years and may accumulate significant amounts of residue which require greater volumes of water to clean.

9.2.7.1 Flow Reduction Control Technologies

Since good water conservation practices are defined by median wastewater volumes per tank cleaned, 50% of existing TEC facilities currently operate good water conservation practices. For the remaining 50% of TEC facilities, EPA considered a variety of control technologies depending upon the extent of flow reduction required at a given facility to achieve the applicable target flow. For the truck and rail subcategories, except for hoppers, the control technologies include the following:

- For facilities with current flow to target flow ratios greater than 1 and less than or equal to 1.5:

  — Facility water use monitoring, and
  — Personnel training in water conservation.

- For facilities with current flow to target flow ratios greater than 1.5 and less than or equal to 2:

  — Facility water use monitoring,
  — Personnel training in water conservation, and
  — Two new spinners and spinner covers.

- For facilities with current flow to target flow ratios greater than 2:

  — Facility water use monitoring,
  — Personnel training in water conservation, and
  — New tank interior cleaning system(s)[1].

For the hopper subcategories, the control technologies include the following:

- For facilities with current flow to target flow ratios greater than 1:

  — Facility water use monitoring, and
  — Personnel training in water conservation.

In calculating compliance cost estimates (see Section 9.3.2), EPA assumed that the flow reduction technologies are sufficient to achieve the target flow for all facilities based on the selection criteria described above. Additional details concerning EPA's flow reduction methodology, the flow reduction control technologies, and application of the flow technologies are included in the TECI cost model documentation contained in the rulemaking record.

[1]New tank interior cleaning system(s) include(s) solution tanks, controls, pumps, piping, catwalks, stairways, rails, and spinners.

9.2.7.2 Development of Target Flows

Waste streams considered in developing the target flows include TEC process wastewater. TEC process wastewater includes the following waste streams:

- Water and steam used to clean tank and container interiors;
- Prerinse cleaning solutions;
- Chemical cleaning solutions;
- Final rinses;
- Tank or trailer exterior cleaning wastewater;
- Equipment and floor washings; and
- TEC-contaminated stormwater.

The following waste streams were not considered in developing the target flows:

- Bilge and ballast waters;
- Non-TEC process wastewaters;
- Sanitary wastewater;
- Tank hydrotesting water; and
- Wastewater generated from rebuilding or maintenance activities.

Target flows were calculated based on responses to the Detailed Questionnaire. EPA first reviewed wastewater streams discharged by each facility and classified these streams as described above. EPA then calculated a facility-specific production-normalized flow expressed in gallons of wastewater discharged per tank cleaned based on the TEC process wastewater flow rate and the annual number of tanks cleaned. Facilities that clean tanks representing multiple modes of transportation (e.g., road, rail, or inland waterway) or that clean both tanks and closed-top hoppers are considered multi-subcategory facilities. For the purpose of developing the target flows, these facilities were assigned a primary subcategory, and the flow contribution of any secondary subcategory was not considered in the analysis.

For each facility type, using the facility-specific production-normalized flows and the corresponding facility-specific survey weighting factors, EPA performed a statistical analysis to determine the median wastewater volume generated per tank cleaned. Detailed information concerning calculation of the target flows is included in the Statistical Support Document for the final rule (2).

9.2.8 Contract Haul in Lieu of Treatment

For some facilities, particularly those with lower flow rates, contract hauling is less expensive than performing on-site treatment. For those facilities, EPA estimates compliance costs based on contract hauling wastewater for off-site treatment instead of the technology bases for the particular regulatory option.

To assess contract hauling in lieu of treatment, EPA compares the net present cost of contract hauling the wastewater for off-site treatment to the net present cost of treating that wastewater on site for each regulatory option (assuming 7% interest and a 15-year equipment life span for all capital equipment). Capital and annual costs estimated for contract hauling wastewater include a wastewater storage tank, repair labor, O&M materials, and transport and off-site disposal of the wastewater.

9.2.9 Costing Methodology for Direct Dischargers in the Barge/Chemical & Petroleum Subcategory

EPA did not use the cost model to estimate compliance costs for direct dischargers in the Barge/Chemical & Petroleum Subcategory. Due to the small number of model facilities, the fact that all of the direct dischargers currently operate biological treatment, and the addition of new wastewater characterization data for the subcategory, EPA believed that it would be more appropriate to consider each model facility on an individual basis rather than use the cost model. EPA gathered information from the Detailed Questionnaire to determine technologies currently in place (Table L) and current discharge limits (Table P) for each model facility. In general, facilities supplied discharge data for only conventional and classical pollutants, and some metals; however, there are several semi-volatile pollutants that are considered pollutants of interest for the subcategory. EPA used BOD and/or COD data to assess current treatment performance for these facilities and to determine if the semi-volatile limitations are currently achieved. For model facilities whose effluent data do not meet the BOD and/or COD long term averages, additional capacity was added to existing biological treatment systems to increase the residence time and/or aeration of biological treatment. Additional capacity and additional aeration are also assumed to achieve the long-term averages for BOD and COD as well as organics. For model facilities whose effluent data do not meet the TSS long term averages, polymer-assisted clarification costs and additional sludge handling costs were added. Additional operator training costs were also included in any costed upgrade.

9.3 Design and Cost Elements for Pollutant Control Technologies

This section presents detailed information regarding cost model components and specific technologies modeled in the cost model.

9.3.1 Cost Model Components

The TECI cost model consists of several programming components, which can be grouped into four major categories:

- Model shell programs;
- Primary model drivers;
- Data storage files; and
- Technology drivers and modules.

The model shell includes programs that create the various menus and user interfaces that accept user inputs and pass them to the appropriate memory storage areas. The primary model drivers are programs that access technology drivers in the appropriate order for each option and process the model-generated data. Data storage files are databases that contain cost model input and output data. Information typically stored in data storage files includes:

- Flow, production, and operating data associated with each wastewater stream;
- Pollutant concentrations associated with each wastewater stream; and
- Facility-specific data regarding existing technologies in place (discussed in Section 9.2.5).

Technology drivers and modules are programs that calculate costs and pollutant loadings for a particular pollutant control technology. EPA developed cost modules for the water conservation practices and wastewater treatment technologies included in the regulatory options for the TECI.

The technology drivers perform the following functions, as applicable, for each technology costed for a facility:

- Locate and open all necessary input data files;
- Store input data entered by the user of the model;
- Open and run the appropriate technology modules; and
- Calculate and track the following types of information generated by each technology module:
  - Total direct capital costs,
  - Total direct annual costs,
  - Electricity use and associated cost,
  - Water use and associated cost,
  - Sludge generation and associated disposal costs,
  - Solid waste generation and associated disposal costs,
  - Waste oil generation and associated disposal costs,
  - Effluent flow rate, and
  - Effluent pollutant concentrations.

The following table lists the treatment technologies that are modeled in the cost model. Sections 9.3.2 through 9.3.20 discuss the technology modules.

Cost Module	Section Number
Flow Reduction	9.3.2
Equalization	9.3.3
Oil/Water Separation (Vertical Tube Coalescing)	9.3.4
Oil/Water Separation (API)	9.3.5
Oil/Water Separation (Gravity)	9.3.6
Gravity Separation	9.3.7
Chemical Oxidation, Neutralization, Coagulation, Clarification	9.3.8
Dissolved Air Flotation (DAF) (with pH Adjustment and Chemical Addition)	9.3.9
DAF (No Chemical Addition)	9.3.10
Filter Press (For Wastewater Clarification and Sludge Dewatering)	9.3.11
Biological Treatment	9.3.12
Biological Treatment with Extended Aeration and Polymer-Assisted Clarification	9.3.13
Activated Carbon Adsorption (Vessels)	9.3.14
Organo-Clay/Activated Carbon Adsorption	9.3.15
Reverse Osmosis	9.3.16
Sludge Dewatering	9.3.17
Contract Haul of Wastewater in Lieu of Treatment	9.3.18
Compliance Monitoring	9.3.19
Waste Hauling	9.3.20

9.3.2 Flow Reduction

In this module, EPA estimates costs for a facility to install wastewater reduction technologies in order to reduce the volume of wastewater generated per tank cleaned. The flow reduction module design is based on the ratio of the current volume of wastewater generated per tank cleaned to the target volume of wastewater generated per tank cleaned. The target volume of wastewater generated per tank cleaned is discussed in Section 9.2.7. The module compares the target flow to the current flow and costs facilities for different flow reduction technologies based on their subcategory and/or the magnitude of their ratio of target flow to current flow (the "flow ratio"). Facilities with a flow ratio less than or equal to 1 (i.e., facilities generating less than the target flow of wastewater per tank cleaned) are not costed in the flow reduction module.

Where the TECI cost model reduces facility wastewater flow rates through volume reduction, specific capital and O&M costs are estimated to account for the costs those facilities would incur to implement flow reduction technologies and practices. Because of the variation in tank types and cleaning practices between subcategories, the costs for implementing flow reduction technologies are different for each subcategory. EPA did not include flow reduction costs for the Barge/Chemical & Petroleum Subcategory due to the wide variation in wastewater volumes generated per cleaning.

EPA bases the implementation costs for flow reduction on data received in response to the TECI Detailed Questionnaire, technologies and practices observed during site visits and sampling episodes at TEC facilities, information received from vendors on the flow reduction technologies, and technical literature. However, EPA does not have information available for every costed facility to determine the extent to which flow reduction is achievable and the exact equipment components and changes in standard operating procedures necessary to achieve the flow reductions estimated by the cost model. Although the cost model estimates costs incurred and wastewater volume reduction achieved by flow reduction, the costs and flow reductions may not be completely accurate for every costed facility due to limitations in the available data. However, EPA believes that the cost model accurately estimates the flow reduction and associated costs for the industry as a whole.

Capital and annual costs for the following equipment and practices listed below are included in the flow reduction module:

- Replacement tank cleaning system (Truck/Chemical & Petroleum, Rail/Chemical & Petroleum, and Food Subcategories (except barge/food facilities));

- Two spinners - one high flow for cleaning solution and one low flow for rinse (Truck/Chemical & Petroleum, Rail/Chemical & Petroleum, and Food Subcategories (except barge/food facilities)); and

- Cleaning crew training and wastewater flow rate monitoring for all subcategories (except Barge/Chemical & Petroleum facilities).

Annual costs include tank cleaning crew training and wastewater flow rate monitoring. Annual costs for operating a replacement tank cleaning system and spinners are assumed to equal baseline costs for operating existing tank cleaning systems; therefore, no additional annual costs are calculated in the cost module for implementing these technologies.

The flow reduction module uses information from responses to the Detailed Questionnaire on current wastewater generation per tank and the number of tanks cleaned along with the target flow (described in Section 9.2.7) to estimate the annual cost credits (i.e., negative annual costs) for savings from reduced water usage. The total volume of water saved is shown by the following equation:

$$WS = (CWG \times NT) - (RFWG \times NT) \tag{3}$$

where:

WS	=	Water savings (gallons/year)
CWG	=	Current wastewater generated per tank cleaned (gallons)
NT	=	Number of tanks cleaned per year
RFWG	=	Target flow wastewater generated per tank cleaned (gallons) (see Table 9-5 for specific target flows)

The volume of water saved is then multiplied by the cost of fresh water (as described in Section 9.2.4.2) to estimate monetary savings from reductions in wastewater use.

9.3.3 Equalization

In this module, EPA estimates costs for a facility to install and operate an equalization tank(s) to accumulate wastewater in order to reduce wastewater variability and to optimize the size, effectiveness, and operating costs for the subsequent treatment units. The required equalization tank size depends on a minimum wastewater residence time. Minimum residence times vary by subcategory (details provided in Section 8.0) based on the ratio of equalization tank size to total wastewater flow rate as observed during EPA sampling episodes and site visits. The equalization module calculates the costs necessary to operate an equalization unit as well as to adequately mix wastewater.

Capital and annual costs for the following equipment are included in the equalization module:

- Equalization tank(s); and
- Aerators/mixer(s).

Annual costs include operational labor, maintenance and repair labor, O&M materials, and electricity. The costs associated with the equalization tank(s) are based on tank volume necessary to perform adequate equalization of TEC wastewater, as observed during EPA site visits and sampling episodes. The costs associated with the aerator/mixer(s) are based on the motor horsepower required to adequately mix the wastewater in the equalization tank, as observed during EPA site visits and sampling episodes.

9.3.4 Oil/Water Separation (Vertical Tube Coalescing)

In this module, EPA estimates costs for a facility to install and operate a vertical tube coalescing oil/water separator to remove entrained oil and grease. The oil/water separation module calculates the costs necessary to treat wastewater using a vertical tube coalescing separator and a demulsifier that is added to the wastewater to aid in oil separation. The module also calculates the costs for removing, storing, and disposing of floating oil and settled solids.

Capital and annual costs for the following equipment are included in the vertical tube coalescing oil/water separator module:

- A demulsifier feed system (including a metered-flow pump and demulsifier);

- An influent wastewater transfer pump;
- An oil/water separator unit (including a water level probe and control system);
- An oil storage tank;
- A sludge transfer pump; and
- A sludge storage tank.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, raw materials (i.e., demulsifier), and oil and settled solids disposal. The oil/water separator observed during EPA site visits and sampling episodes at TEC facilities is sized with 25% excess capacity due to fluctuations in daily wastewater flows. EPA likewise estimates vertical tube coalescing oil/water separator costs based on a unit with a capacity that exceeds average daily wastewater flow rates by 25%.

The demulsifier feed system costs are based on the feed rate of demulsifier observed during EPA site visits and sampling episodes. The costs associated with the wastewater transfer and sludge transfer pumps are based on the horsepower necessary to pump wastewater and sludge at the flow rates estimated by the oil/water separator module.

The waste oil storage tank and sludge storage tank costs are based on tank volume. The oil storage tank and sludge storage tank are sized to hold the volume of oil and sludge, respectively, collected over a period of one month.

EPA assumes that floating oils and settled solids will be disposed off site once per month, based on observations made during site visits and sampling episodes. Waste disposal costs are calculated separately in the waste haul module (see Section 9.3.20). The oil/water separator module calculates the amount of oil to be disposed using the difference between the influent and effluent average total oil and grease concentrations. The oil/water separator module calculates the amount of sludge to be disposed using the difference between the influent and effluent average total suspended solids concentrations. EPA assumes that the waste oil stream comprises 95% oil and the settled solids stream comprises 4% solids, based on assumptions used in the MP&M cost model.

9.3.5 Oil/Water Separation (American Petroleum Institute [API] Separator)

In this module, EPA estimates costs for a facility to install and operate an API oil/water separator to remove entrained oil and grease. The module calculates costs necessary to operate an API separator with a slotted pipe surface oil skimmer, a fabric belt skimmer for entrained thin oils, and a bottom sludge rake. The module also calculates the costs to remove, store, and dispose of skimmed oils and settled solids.

Capital and annual costs for the following equipment are included in the API oil/water separator module:

- An API oil/water separator;
- A wastewater transfer pump;
- An oil storage tank; and
- A sludge storage tank.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and disposal of residual oil and settled solids. The API oil/water separator costs are based on the ratio of API oil/water separator nominal capacity to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. The unit nominal capacity is four times that needed to accommodate facility average daily wastewater flow rates to account for fluctuations in daily wastewater flow and to allow for ample wastewater residence. The unit uses two motors, a scraper/skimmer motor, and an oil collection belt skimmer motor. Electricity costs are based on motor horsepower necessary to operate the scraper/skimmer and oil collection belt skimmer.

The wastewater transfer pump costs are based on the influent wastewater flow rate for each facility. The pump is designed to operate at a flow rate of one-half the stated maximum capacity of the pump. Electricity costs are based on motor horsepower necessary to transfer wastewater at the flow rates estimated by the oil/water separator module.

The waste oil storage tank and sludge storage tank costs are based on tank volume. The oil storage tank and the sludge storage tank are sized to hold the volume of oil and the volume of sludge, respectively, collected over a period of one month.

EPA assumes that floating oils and settled solids will be disposed off site once per month (provided sludge dewatering is not costed as part of the regulatory option) based on observations made during site visits and sampling episodes. Waste disposal costs are calculated separately in the waste haul module (see Section 9.3.20). The API oil/water separator module calculates the amounts of oil and sludge to be disposed based on the ratios of the oil and sludge generation rates to the facility wastewater flow rates observed during EPA site visits and sampling episodes at TEC facilities. If sludge dewatering is costed, the sludge is costed to be pumped from the sludge storage tank to the filter press (the costs for the sludge pump are included in the sludge dewatering module (see Section 9.3.17)). EPA assumes that the waste oil stream comprises 95% oil and the settled solids stream comprises 4% solids, based on assumptions used in the MP&M cost model.

9.3.6 Oil/Water Separation (Gravity)

In this module, EPA estimates costs for a facility to install and operate a gravity oil/water separator to remove floating oils from raw wastewater. The module also calculates the costs necessary to remove, store, and dispose of floating oils. For the Food Subcategory, no oil disposal costs are incurred because EPA assumes oil will be recycled to animal feed and/or soap manufacturing based on practices observed during EPA site visits and sampling episodes at TEC facilities. The module calculates the costs for removing, storing, and disposing of settled solids for the Food Subcategory but not for the Barge/Chemical & Petroleum Subcategory because EPA assumes gravity oil/water separators at Barge/Chemical & Petroleum facilities will generate a negligible amount of settled solids based on observations made during EPA site visits and sampling episodes.

Capital and annual costs for the following equipment are included in the gravity oil/water separation module:

- A gravity oil/water separator;
- Two wastewater transfer pumps (only one for Barge/Chemical & Petroleum);
- An oil transfer pump;
- An oil storage tank (Barge/Chemical & Petroleum only);
- A sludge transfer pump (Food only); and
- An oil/water separator effluent pump (Barge/Chemical & Petroleum only).

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and residual disposal costs. The gravity oil/water separator costs are based on tank volume designed to provide a wastewater residence time of 6.4 days, as observed during EPA site visits and sampling episodes at TEC facilities.

The wastewater transfer pumps and oil transfer pump costs are based on the respective wastewater and oil flow rates estimated by the oil/water separator module. The pumps are designed to operate at an average flow rate of one-half the stated maximum flow-rate capacity of the pump. Electricity costs are based on the pump motor horsepower necessary to transfer wastewater and oil at the flow rates estimated by the oil/water separator module. The sludge transfer pump costs are based on the horsepower necessary to pump sludge at the flow rates estimated by the oil/water separator module. The effluent wastewater pump costs are based on effluent wastewater flow rate. Electricity costs are based on the motor horsepower necessary to pump wastewater to the subsequent treatment unit.

Oil and sludge management practices are based on practices observed during EPA site visits and sampling episodes at TEC facilities. For the Barge/Chemical & Petroleum Subcategory, oil is collected in a tank and assumed to be hauled off site every 5 days. Oil storage tank costs are based on the tank volume necessary to hold the oil generated over a 5-day period. For the Food Subcategory, oil is pumped directly from the gravity oil/water separator tank for off-site disposal twice per year. Sludge is collected either directly from the gravity oil/water separator tank and hauled off site for disposal once per month or pumped to a sludge storage tank (included in the biological treatment module) for subsequent on-site sludge dewatering. Waste disposal costs are calculated separately in the waste haul module (see Section 9.3.20). The oil and sludge volumes generated (where applicable) are calculated based on the ratios of the oil and sludge generation rates to the facility wastewater flow rates observed during EPA site visits and sampling episodes at TEC facilities. EPA assumes that the waste oil stream comprises 95% oil and the settled solids stream comprises 4% solids, based on assumptions used in the MP&M cost model.

9.3.7 Gravity Separation

In this module, EPA estimates costs for a facility to install and operate a gravity separator to remove suspended solids from raw wastewater by settling to the bottom of the unit. The module also calculates the costs for removing, storing, and disposing of settled solids.

Capital and annual costs for the following equipment are included in the gravity separation module:

- A gravity separator tank;
- Two wastewater transfer pumps; and
- A sludge transfer pump (if sludge generation is less than 1,265 gallons per month).

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and residual disposal costs. The gravity separator tank costs are based on a tank volume designed to provide a wastewater residence time of 4 days, as observed during EPA site visits and sampling episodes at TEC facilities.

The wastewater transfer pump costs are based on influent wastewater flow rate. The pumps are designed to operate at a flow rate of one-half the stated maximum flow rate capacity of the pumps. Electricity costs are based on motor horsepower necessary to transfer wastewater at the flow rates estimated by the gravity separator module. The sludge transfer pump costs are based on motor horsepower necessary to transfer sludge at the flow rates estimated by the gravity separator module.

EPA assumes that settled solids will be disposed off site once per month based on observations made during site visits and sampling episodes at TEC facilities. Waste disposal costs are calculated separately in the waste haul module (see Section 9.3.20). The sludge volume generated by the gravity separator is calculated based on the ratios of the sludge generation rates to the facility wastewater flow rates observed during EPA site visits and sampling episodes at TEC facilities. Sludge is assumed to accumulate in the bottom of the gravity separator tank. If the monthly sludge generation is less than 1,265 gallons, it is more economical for a facility to pump the sludge into drums for disposal. Otherwise, a vacuum truck (provided by the sludge disposal company) would be used to remove the sludge. EPA assumes the settled solids stream comprises 4% solids, based on engineering literature.

9.3.8 Chemical Oxidation, Neutralization, Coagulation, and Clarification

In this module, EPA estimates costs for a facility to install and operate a turn-key treatment system consisting of four reaction tanks in series and a clearwell. Treatment steps include: chemical oxidation to oxidize organic pollutants using hydrogen peroxide; neutralization to adjust wastewater pH; coagulation to destabilize suspended matter using polyalum chloride (an electrolyte); and clarification to settle and remove agglomerated solids using a polymer flocculant.

The module calculates costs necessary for the turn-key treatment system, including the reaction tanks, clearwell, chemical feed systems, mixers, control system, and two sludge storage tanks. The module also calculates the costs to collect solids from the bottom of the clarifier and pump the sludge into a sludge storage tank for subsequent dewatering.

Capital and annual costs for the following equipment are included in the chemical oxidation, neutralization, coagulation, and clarification module:

- Four reaction tanks;
- Two sludge storage tanks;
- A clearwell;
- Five chemical feed systems;
- Two mixers;
- An influent wastewater pump;
- A sludge pump (sized at 20 gpm); and
- A control system.

Annual costs include operational labor, maintenance and repair labor, O&M materials, and electricity. The turn-key package system costs are based on the nominal wastewater flow rate capacity of the unit. The turn-key package system observed during EPA sites visits and sampling episodes at TEC facilities is sized with 25% excess capacity due to fluctuations in daily wastewater flows. EPA likewise estimates turn-key package system costs based on a unit with a capacity that exceeds daily wastewater flow rates by 25%. Electricity costs for the mixers, chemical feed systems, and sludge pump are based on motor horsepower necessary to operate the turn-key unit.

9.3.9 DAF (with pH Adjustment and Chemical Addition)

In this module, EPA estimates costs for a facility to install and operate a DAF unit designed to remove entrained solid or liquid particles. The module calculates the costs necessary to operate a DAF unit with a recycle pressurization system, chemical addition systems for polymers (coagulants and flocculant) and pH adjustment, and a sludge collection tank. The module also calculates costs for a pre-engineered building to enclose the treatment unit.

Capital and annual costs for the following equipment are included in the DAF module:

- A wastewater transfer pump;
- A chemical treatment tank system;
- A polymer mixing tank system;
- A polymer dilution tank system;
- A DAF unit;
- An air compressor;
- A sludge storage tank; and
- A pre-engineered building.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and chemical costs. The DAF unit observed during EPA site visits and sampling episodes at TEC facilities is sized with 30% excess capacity due to fluctuations in daily wastewater flows. EPA likewise estimates DAF unit costs based on a unit with a capacity that exceeds daily wastewater flow rates by 30%. The unit uses two motors: a surface skimmer motor and a pressurization motor pump. Electricity costs are based on motor horsepower necessary to operate the surface skimmer motor and pressurization pump.

The wastewater transfer pump costs are based on influent wastewater flow rate. Pumps are designed to operate at a flow rate of one-half the stated maximum capacity of the pump. Electricity costs are based on motor horsepower necessary to transfer wastewater at the influent wastewater flow rates.

The chemical treatment tank system consists of a treatment tank, mixer, pH probe, acid metering pump, and caustic metering pump. The treatment tank costs are based on the ratio of tank volume to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. The mixer costs are based on tank volume and motor horsepower necessary to operate the mixer. The pH probe and acid metering pump costs are the same for every facility. The caustic metering pump costs are based on tank volume. Sulfuric acid (93%) and sodium hydroxide (50%) are added to the wastewater. The volume of chemicals added is based on the ratio of chemical addition to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

The polymer mixing tank system consists of a mixing tank, a mixer, and two metering pumps. The tank costs are based on the ratio of mixing tank volume to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. The mixer costs are based on tank volume and motor horsepower necessary to operate the mixer. The metering pump cost is the same for every facility. The polymer dilution tank system consists of the same components as the polymer mixing tank system except it includes only one metering pump. Polymer addition rates are based on the ratio of polymer addition to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

The sludge storage tank costs are based on the ratio of sludge storage tank volume to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. Sludge is collected in the storage tank before being dewatered. (Costs for a sludge storage tank designed to collect sludge over the period of a month were estimated for facilities currently operating a DAF unit without sludge dewatering.) Costs for sludge dewatering are estimated in the sludge dewatering module (see Section 9.3.17). The DAF unit sludge generation rates are based on information gathered from the Detailed Questionnaire from facilities operating DAF units with chemical addition.

The pH adjustment and DAF units are housed in the pre-engineered building to provide protection from poor weather conditions. The pre-engineered building costs are based on the square footage of building space needed to house the DAF unit and associated equipment. Since differences in the sizes of equipment housed in the pre-engineered building are minor, costs for all facilities are estimated for the same building size.

9.3.10 DAF (without Chemical Addition)

In this module, EPA estimates costs for a facility to install and operate a DAF unit designed to remove entrained solid or liquid particles. The module calculates the costs necessary to operate a DAF unit and collect solids for disposal off site (for facilities with treatment in place but no sludge dewatering on site) or for on-site sludge dewatering.

Capital and annual costs for the following equipment are included in this DAF module:

- A DAF unit; and
- A sludge storage tank.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and residual disposal (if sludge dewatering costs are not included). The DAF unit costs are based on the ratio of DAF unit capacity to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. Electricity costs are based on the motor horsepower necessary to operate the DAF unit.

A sludge storage tank is only included in baseline options where a facility does not operate sludge dewatering on site. A sludge storage tank is sized to hold the volume of sludge collected over a period of one month. Waste disposal costs are calculated separately in the waste haul module (see Section 9.3.20). The sludge storage tank costs are based on volume. The DAF module calculates the amount of sludge to be disposed based on the ratio of DAF sludge generation rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. EPA assumes that the DAF sludge comprises 4% solids, based on assumptions used in the MP&M cost model.

9.3.11 Filter Press (for Wastewater Clarification and Biological Treatment Sludge Dewatering)

In this module, EPA estimates costs for a facility to install and operate a single filter press for two operations: wastewater clarification and biological treatment sludge dewatering. During wastewater treatment operating hours, the filter press functions as a wastewater clarifier. Following wastewater treatment operating hours, the filter press dewaters sludge from biological treatment. The module calculates the costs necessary to filter and store wastewater before being discharged or pumped to subsequent treatment units. The module also calculates annual costs associated with sludge dewatering. The filter press is designed to treat one batch of wastewater per day and one batch of biological treatment sludge per day.

Capital and annual costs for the following equipment are included in the filter press module:

- An influent pump and compressor;
- A diatomaceous earth precoat tank;
- A diatomaceous earth precoat pump and compressor;
- A filter press; and
- An effluent storage tank.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and residual disposal. Based on observations made during EPA site visits and sampling episodes, EPA assumes that both operations generate equal daily volumes of dewatered sludge. Dewatered sludge volumes are based on the ratio of dewatered sludge generation rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. The filter press volume is based on and equal to the volume of dewatered sludge from either one of the operations (since they are assumed to generate equal volumes). Waste disposal costs are calculated separately in the waste haul module (see Section 9.3.20) and are based on the total volume of dewatered sludge from both filter press operations. EPA assumes the dewatered filter cake volume comprises 32% solids, based on engineering literature.

The influent pump and precoat transfer pump costs are based on influent wastewater flow rate. Electricity costs for the pumps are based on motor horsepower necessary to transfer wastewater and polymer at the flow rates estimated by the filter press module.

The diatomaceous earth precoat tank costs and effluent storage tank costs are based on tank volumes recommended by filter press vendors. The amount of diatomaceous earth necessary to treat wastewater and biological treatment sludge is based on the ratio of diatomaceous earth usage rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

9.3.12 Biological Treatment

In this module, EPA estimates costs for a facility to install and operate a biological oxidation unit used to decompose organic constituents. The module calculates costs necessary for operating an aerobic biological treatment unit consisting of two preaeration tanks, a post-treatment clarifier, and a sludge storage tank. A portion of the sludge is recycled by pumping the sludge from the clarifier to the second preaeration tank. Sludge is also pumped from the clarifier into a sludge storage tank for subsequent dewatering.

Capital and annual costs for the following equipment are included in the biological treatment module:

- Wastewater transfer pumps;
- Two preaeration tanks;
- Diffusers/blowers;
- A biological reactor tank;
- A clarifier;
- A sludge storage tank;
- A sludge pump; and
- A biological treatment effluent discharge pump.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and residual disposal. The biological reactor capital and annual costs are based on a tank volume designed to provide a wastewater residence time of 4.6 days, as observed during EPA site visits and sampling episodes at TEC facilities. Annual additions of microorganisms to the biotreatment unit is based on the ratio of microorganism addition rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

The wastewater transfer pump costs are based on influent wastewater flow rate. Electricity costs for the pumps are based on motor horsepower necessary to transfer wastewater at the influent flow rate. The diffuser/blower costs are based on the ratio of air flow rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

The preaeration and sludge storage tank volumes are based on the ratio of tank volume to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. The sludge and effluent discharge pump costs are based on motor horsepower necessary to transfer sludge and wastewater at the flow rates estimated by the biological treatment module.

The clarifier is used to settle sludge following the biological digestion in the biological reactor. Clarifier costs are based on the ratio of clarified volume to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

9.3.13 Biological Treatment with Extended Aeration and/or Polymer-Assisted Clarification

These treatment technologies only apply to the Barge/Chemical & Petroleum Subcategory; therefore, no electronic cost module was developed. EPA estimates costs for a facility to install and operate additional aerators and polymer-assisted clarification for those facilities not currently meeting the BOD, COD, and/or TSS long term averages. These technologies are applicable to waste streams following primary treatment, such as oil/water separation or equalization.

Capital and annual costs for the following equipment are included in the treatment technology estimates:

- Polymer addition system (e.g., feed pump); and
- Aeration diffusers and blowers.

Annual costs include operational labor, maintenance and repair labor, O&M materials, chemical costs, electricity, and residual disposal. The polymer feed pump capital and annual costs are based on a Garratt-Callahan Polymer 7622 metering pump which can accommodate 0.02 to 0.6 gallons per hour of polymer. The aeration diffusers and blowers capital and annual costs are based on the additional oxygen requirement at each facility.

The polymer metering pump cost is the same for every facility. Polymer addition rates are based on the ratio of polymer addition to wastewater flow rate based on data from the Pharmaceutical Manufacturing Industry cost model. Residual disposal costs are based on the incremental volume of solids removed by subtracting the TSS treatment effectiveness concentration from the current effluent TSS concentration and converting the difference to either an incremental filter cake volume or raw sludge volume.

Aeration diffusers and blowers costs are based on the additional volume of oxygen required based on a facility's influent BOD concentration and assuming the treatment effectiveness concentration is achieved. In addition to operational and repair labor, costs for materials, electricity, and labor training are included to optimize biological treatment performance.

9.3.14 Activated Carbon Adsorption (Vessels)

In this module, EPA estimates costs for a facility to install and operate an activated carbon adsorption system used as a tertiary treatment technology applicable to waste streams following treatment by chemical oxidation, neutralization, coagulation, and clarification. The module calculates costs necessary for operating two activated carbon columns in series. Spent carbon is assumed to require off-site regeneration once per month.

Capital and annual costs for the following equipment are included in the granular activated carbon module:

- Two wastewater transfer pumps;
- Two bag filters operated in series;
- A backwash tank; and
- Two carbon adsorption filters.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, chemicals (media changeout), weekly COD monitoring, and residual disposal. The capital and annual costs associated with the carbon adsorption filters are based on the ratios of activated carbon system size and carbon usage rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

The costs associated with the wastewater transfer pumps are based on influent wastewater flow rate. Electricity costs are based on motor horsepower necessary to operate the carbon adsorption system.

The costs associated with the bag filters are based on two carbon steel 2-inch housings with 5-micron bag filters. Bag costs are based on using one bag per operating day, and labor costs are based on operating days per year. The backwash tank volume is based on the volume required to hold 30 minutes worth of daily wastewater flow at the facility. Operational labor to backwash the system is included.

EPA assumes that one column of spent activated carbon is changed out once per month. Media change-out costs include costs for labor and fresh media. Weekly COD monitoring of influent and effluent from the carbon vessels is included to test the effectiveness of the carbon. Spent carbon is assumed to be sent off site for regeneration. Media change-out costs include costs for labor and fresh media. For cost estimating purposes, EPA assumes that TEC facilities typically operate an average of 265 days per year. Costs are adjusted for facilities operating less than 265 days per year by multiplying "typical" residual regeneration costs by a factor consisting of actual operating days divided by 265.

9.3.15 Organo-Clay/Activated Carbon Adsorption

In this module, EPA estimates costs for a facility to install and operate an organo-clay adsorption unit followed by a granular activated carbon unit for wastewater polishing. The module calculates costs to operate two columns in series (organo-clay followed by activated carbon) with nominal carbon change-out frequency of one vessel per month and nominal organo-clay change-out frequency of one vessel per two months.

Capital and annual costs for the following equipment are included in the organo-clay/activated carbon adsorption module:

- A wastewater transfer pump;
- An organo-clay vessel; and
- A granular activated carbon vessel.

Annual costs include operational labor, maintenance and repair labor, electricity, chemicals (media), and residual disposal. The costs associated with the organo-clay vessel and granular activated carbon vessels are based on the ratio of filter media volume to influent flow rate observed during EPA site visits and sampling episodes at TEC facilities.

The costs associated with the wastewater transfer pump are based on influent wastewater flow rate. The pump is designed to operate at a flow rate of one-half the stated maximum capacity of the pump. Electricity costs are based on motor horsepower necessary to transfer influent wastewater.

The design media change-out frequency is once per month for granular activated carbon, and once every two months for organo-clay, based on information provided by treatment system vendors. Spent carbon is assumed to be sent off site for regeneration or disposal and spent clay is assumed to be sent off site for incineration. Media change-out costs include costs for labor and fresh media. Residual disposal costs include costs for waste shipping and media disposal.

9.3.16 Reverse Osmosis

In this module, EPA estimates costs for a facility to install and operate a reverse osmosis unit for wastewater polishing. The module calculates costs necessary for wastewater storage prior to entering the reverse osmosis unit, and the reverse osmosis unit itself. The reverse osmosis unit is operated as a double pass unit. After the first pass through the reverse osmosis unit, the wastewater is transferred to a storage tank. When the storage tank is nearly full, the wastewater is pumped for a second pass through the reverse osmosis unit prior to discharge. Concentrate from the reverse osmosis unit is recycled to the first biological treatment preaeration tank.

Capital and annual costs for the following equipment are included in the reverse osmosis module:

- Two reverse osmosis wastewater storage tanks;
- A reverse osmosis flooded suction tank; and
- A reverse osmosis unit.

Annual costs include operational labor, maintenance and repair labor, electricity, and membrane and pretreatment filter replacement costs. The reverse osmosis unit capital costs are based on influent wastewater flow rate. Electricity costs are based on motor horsepower necessary to operate the unit at the flow rate estimated by the reverse osmosis module. Membrane and filter replacement costs are based on influent wastewater flow rate and information provided by treatment technology vendors. EPA estimates that membranes require replacement every five years, and the pretreatment filter cartridges must be replaced every two months.

The reverse osmosis wastewater storage tanks and flooded suction tank costs are based on the ratio of tank volume to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

9.3.17 Sludge Dewatering (Plate-and-Frame Filter Press)

In this module, EPA estimates costs for a facility to install and operate a plate-and-frame filter press. The module calculates costs necessary to operate a plate-and-frame filter press to dewater sludge that is generated by wastewater treatment units.

For the Truck/Chemical & Petroleum Subcategory, EPA assumes that facilities will use a portable pump to pump sludge from the sludge storage tanks into the filter press. Because EPA includes a portable pump in the oil/water separator module (see Section 9.3.4), costs are not included for an additional pump in the sludge dewatering module for the Truck/Chemical & Petroleum Subcategory.

Capital and annual costs for the following equipment are included in the plate-and-frame filter press module:

- A plate-and-frame filter press;
- Sludge transfer pumps (Rail/Chemical & Petroleum and Food Subcategory);
- Sludge storage tank (PSES Option 1 for the Rail/Chemical & Petroleum Subcategory);

- Precoat (diatomaceous earth) tank (for dewatering biological treatment sludge); and

- Precoat transfer pump and compressor (for dewatering biological treatment sludge).

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, chemical costs (diatomaceous earth), and residual disposal costs. Materials costs include annual replacement of filter press cloths. The filter press capital and annual costs are calculated using the ratio of sludge generation rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities, as well as technical literature on sludge and filter cake solids contents. In general EPA assumes that the press operates one batch per day; therefore, the press volume generally equals the estimated daily volume of filter cake generation. However, for the Truck/Chemical & Petroleum and Rail/Chemical & Petroleum Subcategories, EPA performed an optimization analysis to determine filter press volume versus the number of batches per day based on the filter cake generation rate and operational days per year. EPA assumes that the filter press will operate no more than two batches per day. The cost for hauling dewatered sludge is estimated separately in the waste haul module (see Section 9.3.20) and is based on the calculated volume of dewatered sludge generated. EPA assumes that the dewatered sludge comprises 32 to 33% solids, based on engineering literature. A one-time sludge profile fee and roll-off box delivery fee are also included.

The sludge transfer pump costs are based on motor horsepower necessary to transfer sludge at flow rates estimated by the sludge dewatering module. The precoat transfer pump costs are based on influent wastewater flow rate. Electricity costs are based on motor horsepower necessary to transfer polymer at flow rates estimated by the sludge dewatering module.

The diatomaceous earth precoat tank costs are based on tank volumes recommended by filter press vendors. The amount of diatomaceous earth necessary is based on the ratio of diatomaceous earth usage rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

9.3.18 Contract Hauling of Wastewater in Lieu of Treatment

In this module, if contract hauling in lieu of treatment is appropriate, capital and annual costs for a wastewater holding tank are included in the module. Annual costs include maintenance and repair labor, O&M materials, transportation, and disposal of wastewater. EPA assumes that wastewater would be accumulated in a holding tank and then disposed off site every three months. Holding tank costs are based on the tank volume needed to contain all of the wastewater generated by a facility over a three-month period.

Transportation disposal costs are based on gallons of wastewater to be disposed. EPA uses quotes from nation-wide vendors to estimate costs for contract hauling wastewater off site. EPA estimates a cost of $0.44/gallon (7) to contract haul wastewater off site.

9.3.19 Compliance Monitoring

Compliance monitoring costs are included in all of the regulatory options for all subcategories.

In this module, EPA estimates annual compliance monitoring costs for all TEC facilities. The annual cost calculated by the model for compliance monitoring includes laboratory costs to analyze wastewater semivolatile organics, metals, and classical pollutants. For indirect dischargers, EPA estimates costs for facilities to monitor monthly for all regulated pollutants (see Section 12.3). For direct dischargers, EPA estimates costs for facilities to monitor weekly for classical pollutants and monthly for semivolatile organics and metals. However, for direct dischargers in the Food Subcategory, EPA estimates costs for facilities to monitor weekly for only classical pollutants because EPA is regulating only these pollutants in the Food Subcategory. Costs for each type of analysis per sample were obtained from a laboratory contracted by EPA on past wastewater sampling efforts. The table below shows the monitoring costs used in the cost model.

Analytical Method	Laboratory Fee ($1994)	Reference
Method 625 - Semi-Volatile Organic Compounds	$350	(39)
Method 1620 - Metals	$598	(8)
Method 1664 - HEM	$35	(8)
Method 1664 - SGT-HEM	$56.67	(39)
Method 401.5 - BOD	$16	(8)
Method 410.4 - COD	$20	(8)
Method 160.2 - TSS	$6.50	(40)

9.3.20 Waste Hauling

In this module, where applicable, EPA estimates annual waste hauling costs for oil (95% oil), undewatered sludge (approximately 4% solids), and dewatered sludge (approximately 32% solids) for all TEC facilities. The cost model calculates annual costs for waste hauling, including labor and transportation. Cost rates are obtained from national vendors. Undewatered sludge disposal costs are based on using either a vacuum-truck or multiple drums, depending on the volume to be disposed. Dewatered sludge costs include an annual roll-off box rental.

9.4 Summary of Costs by Regulatory Option

Table 9-6 summarizes estimated BPT, BCT, and BAT compliance costs by regulatory option. Table 9-7 summarizes estimated PSES compliance costs by regulatory option. Costs shown include capital and O&M costs (including energy usage) totaled for each subcategory for all discharging facilities. All costs represent the estimated incremental compliance costs to the industry. The capital costs shown in Tables 9-6 and 9-7 represent the direct capital costs estimated by the technology modules plus the indirect capital costs discussed in Section 9.2.4.1. The annual costs shown in Tables 9-6 and 9-7 represent the direct annual costs estimated by the technology modules plus the compliance monitoring and waste hauling costs discussed in Sections 9.3.19 and 9.3.20, respectively.

9.5 References[2]

1. U.S. Environmental Protection Agency, Office of Water. Economic Analysis for the Final Effluent Limitations Guidelines for the Transportation Equipment Cleaning Industry. EPA 821-R-00-013, June 2000.

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3. The Richardson Rapid System Process Plant Construction Estimating Standards. Volume 4: Process Equipment, 1994.

4. Eastern Research Group, Inc. Standard Annual Cost Rates Used in the TECI Cost Model. Memorandum from Melissa Cantor, Eastern Research Group, Inc. to the TECI Rulemaking Record, April 22, 1998 (DCN T09977).

5. Eastern Research Group, Inc. Flow Reduction Cost Module Documentation for the Transportation Equipment Cleaning Cost Model. May 1998 (DCN T09753).

6. "Economic Indicators." Chemical Engineering. September 1995, page 168.

7. Eastern Research Group, Inc. Contract Haul Cost Module Documentation for the Transportation Equipment Cleaning Cost Model. May 1998 (DCN T09754).

8. Eastern Research Group, Inc. Monitoring Cost Module Documentation for the Transportation Equipment Cleaning Cost Model. May 1998 (DCN T09852).

9. Eastern Research Group, Inc. Equalization Cost Module Documentation Transportation Equipment Cleaning Cost Model Truck/Chemical Subcategory. May 1998 (DCN T09730).

10. Eastern Research Group, Inc. Oil/Water Separation Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Truck/Chemical Subcategory (Direct Dischargers). May 1998 (DCN T09734).

11. Eastern Research Group, Inc. Oil/Water Separation Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Truck/Chemical Subcategory (Indirect Dischargers). May 1998 (DCN T09731).

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[2]For those references included in the administrative record supporting the TECI rulemaking, the document control number (DCN) is included in parentheses at the end of the reference.

12. Eastern Research Group, Inc. Chemical Oxidation/Neutralization/Coagulation/ Clarification Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Truck/Chemical Subcategory (Direct Dischargers). May 1998 (DCN T09735).

13. Eastern Research Group, Inc. Chemical Oxidation/Neutralization/Coagulation/ Clarification Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Truck/Chemical Subcategory (Indirect Dischargers). May 1998 (DCN T09732).

14. Eastern Research Group, Inc. Sludge Dewatering Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Truck/Chemical Subcategory (Direct Dischargers). May 1998 (DCN T09726).

15. Eastern Research Group, Inc. Sludge Dewatering Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Truck/Chemical Subcategory (Indirect Dischargers). May 1998 (DCN T09723).

16. Eastern Research Group, Inc. Biological Treatment Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Truck/Chemical Subcategory (Direct Dischargers). May 1998 (DCN T09736).

17. Eastern Research Group, Inc. Activated Carbon Adsorption Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Truck/Chemical Subcategory. May 1998 (DCN T09733).

18. Eastern Research Group, Inc. Oil/Water Separation Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Rail/Chemical Subcategory (Direct Dischargers). May 1998 (DCN T09741).

19. Eastern Research Group, Inc. Oil/Water Separation Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Rail/Chemical Subcategory (Indirect Dischargers). May 1998 (DCN T09737).

20. Eastern Research Group, Inc. Equalization Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Rail/Chemical Subcategory. May 1998 (DCN T09738).

21. Eastern Research Group, Inc. pH Adjustment/Dissolved Air Flotation Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Rail/Chemical Subcategory (Direct Dischargers). May 1998 (DCN T09742).

22. Eastern Research Group, Inc. pH Adjustment/Dissolved Air Flotation Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Rail/Chemical Subcategory (Indirect Dischargers). May 1998 (DCN T09739).

23. Eastern Research Group, Inc. Sludge Dewatering Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Rail/Chemical Subcategory (Direct Dischargers). May 1998 (DCN T09727).

24. Eastern Research Group, Inc. Sludge Dewatering Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Rail/Chemical Subcategory (Indirect Dischargers). May 1998 (DCN T09724).

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26. Eastern Research Group, Inc. Organo-Clay/Granular Activated Carbon Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Rail/Chemical Subcategory. May 1998 (DCN T09740).

27. Eastern Research Group, Inc. Primary Oil/Water Separation and Dissolved Air Flotation Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Barge/Chemical Subcategory. May 1998 (DCN T09744).

28. Eastern Research Group, Inc. Filter Press Cost Module: Sludge Dewatering Documentation for the Transportation Equipment Cleaning Cost Model Barge/Chemical Subcategory (Baseline). May 1998 (DCN T09851).

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31. Eastern Research Group, Inc. Reverse Osmosis Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Barge/Chemical Subcategory. May 1998 (DCN T09746).

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33. Eastern Research Group, Inc. Oil/Water Separation Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Food Subcategories. May 1998 (DCN T09749).

34. Eastern Research Group, Inc. Biological Treatment Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Food Subcategories. May 1998 (DCN T09750).

35. Eastern Research Group, Inc. Sludge Dewatering Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Food Subcategories. May 1998 (DCN T09729).

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39. Eastern Research Group, Inc. TECI Cost Model Revision Documentation. June 1999 (DCN T20322).

40. Eastern Research Group, Inc. Barge/Chemical & Petroleum (Direct Dischargers) Costing Calculation Sheets. May 1999 (DCN T20379).

41. Eastern Research Group, Inc. Costs for Filter Press Cloths. July 1998 (DCN T20487).

Table 9-1

Number of Costed Technology Options for Each TECI Subcategory

Subcategory	Number of Unique Technology Options	Number of BPT/BCT/BAT/ NSPS Options	Number of PSES/PSNS Options
Truck/Chemical & Petroleum	5	2	3
Rail/Chemical & Petroleum	6	3	3
Barge/Chemical & Petroleum	3	2	3
Food	2	2	2
Truck/Hopper	1	NA	1
Rail/Hopper	1	NA	1
Barge/Hopper	1	1	1

NA - Not Applicable

Table 9-2

Direct Capital Costs Used by the TECI Cost Model

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
Cleaning bays	C = 65,000 - 74,928 for 1 bay (based on tank type) C = 80,000 - 82,798 for 2 bays (based on tank type) C = 150,000 - 165,596 for 4 bays (based on tank type)	Truck/Chemical & Petroleum Rail/Chemical & Petroleum	Flow Reduction	(5)
Spinners and covers (2)	C = 10,000	Truck/Chemical & Petroleum Rail/Chemical & Petroleum	Flow Reduction	(5)
Equalization tank	C = 1.002(V) + 4,159.944	Truck/Chemical & Petroleum Food	Equalization	(9, 32)
Equalization tank mixer/aerator	C = 463 for V <16,667 C = 573 for V <33,333 C = 804 for V $\geq$33,333	Truck/Chemical & Petroleum Food	Equalization	(9, 32)
Demulsifier pump	C = 1,634	Truck/Chemical & Petroleum	Oil/Water Separator	(10, 11)
Oil/water separator (vertical tube coalescing)	C = -0.926(GPM)^2 + 247.9(GPM) + 6,209	Truck/Chemical & Petroleum	Oil/Water Separator	(10, 11)
Oil storage tank	C = 0.874(V) + 202.45	Truck/Chemical & Petroleum Barge/Chemical & Petroleum	Oil/Water Separator	(10, 11, 27)
Sludge transfer pump	C = 2,102 for GPM $\leq$ 2 C = 1,602 for GPM >2	Truck/Chemical & Petroleum Truck/Hopper Rail/Hopper Barge/Hopper Food	Oil/Water Separator, Gravity Separation	(10, 11, 33, 36)
Sludge storage tank	C = 0.846(V) + 355.163	Truck/Chemical & Petroleum	Oil/Water Separator	(10, 11)
Chemical oxidation/coagulation/ clarification system	C = -3.885(GPM)^2 + 1,374.588(GPM) + 49,978.01	Truck/Chemical & Petroleum	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)

Table 9-2 (Continued)

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
Polyalum chloride storage tank	C = 6,698	Truck/Chemical & Petroleum	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)
Plate-and-frame filter press	$C = -6.244(FCV)^2 + 1{,}527.685(FCV) + 10{,}379.655$	Truck/Chemical & Petroleum Rail/Chemical & Petroleum Barge/Chemical & Petroleum Food	Filter Press, Sludge Dewatering	(14, 15, 23, 24, 28, 29, 35)
Dewatered sludge profile fee and roll-off box drop-off fee	C = 487	Truck/Chemical & Petroleum Rail/Chemical & Petroleum Barge/Chemical & Petroleum Food	Sludge Dewatering, Filter Press	(7)
Un-dewatered sludge profile fee	C = 200	Truck/Chemical & Petroleum Rail/Chemical & Petroleum Barge/Chemical & Petroleum Food Truck/Hopper Rail/Hopper Barge/Hopper	Oil/Water Separation, Dissolved Air Flotation, Chemical Oxidation, Neutralization, Coagulation, Clarification Biological Treatment, Gravity Separation	(7)
Wastewater pumps (for carbon adsorption system)	$C = -0.11(GPM)^2 + 31.706(GPM) + 562.079$	Truck/Chemical & Petroleum	Activated Carbon Adsorption	(17)
Activated carbon adsorption vessels (2 vessels)	$C = 12.237(ACV)^{1.026}$	Truck/Chemical & Petroleum	Activated Carbon Adsorption	(17)
Bag filters	C = 649.69	Truck/Chemical & Petroleum	Activated Carbon Adsorption	(39)
Backwash tank	$C = 0.9047(V) + 328.65$	Truck/Chemical & Petroleum	Activated Carbon Adsorption	(39)

Table 9-2 (Continued)

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
Wastewater transfer pump	$C = 0.0124(GPM)^3 - 0.985(GPM)^2 + 23.352(GPM) + 847.032$	Rail/Chemical & Petroleum Barge/Chemical & Petroleum Truck/Hopper Rail/Hopper Barge/Hopper	Oil/Water Separation, pH Adjustment, Gravity Separation, Organo-Clay/Activated Carbon Adsorption	(18, 19, 21, 22, 26, 36)
Oil transfer pump	$C = 0.0124(GPM)^3 - 0.985(GPM)^2 + 23.352(GPM) + 847.032$	Rail/Chemical & Petroleum Barge/Chemical & Petroleum	Oil/Water Separation	(18, 19, 27)
Oil/water separator (API)	$C = -0.312(GPM)^2 + 277.123(GPM) + 38{,}266.407$	Rail/Chemical & Petroleum	Oil/Water Separation	(18, 19)
Oil storage tank	$C = 1.949(V) + 573.468$ for $V>185$ gallons $C = 970$ for $V \leq 185$ gallons	Rail/Chemical & Petroleum	Oil/Water Separation	(18, 19)
Sludge storage tank	$C = 2.668(V) + 154.792$ for $V>55$ gallons $C = 193$ for $V \leq 55$ gallons	Rail/Chemical & Petroleum	Oil/Water Separation	(18, 19)
Equalization tank	$C = -0.000017(V)^2 + 1.185(V) + 673.73$	Rail/Chemical & Petroleum	Equalization	(20)
Equalization tank agitator	$C = 2827.932LOG_{10}(HP) + 4{,}604.077$	Rail/Chemical & Petroleum	Equalization	(20)
Chemical addition tank and polymer mixing tank	$C = 4.27(V) + 684.194$	Rail/Chemical & Petroleum	pH Adjustment, DAF	(21, 22)
Chemical addition tank mixer	$C = 1.162(V) + 622.232$	Rail/Chemical & Petroleum	pH Adjustment	(21, 22)
pH probe	$C = 1{,}177.70$	Rail/Chemical & Petroleum	pH Adjustment	(21, 22)
Acid addition pump	$C = 316.8$	Rail/Chemical & Petroleum	pH Adjustment	(21, 22)
Caustic addition pump	$C = 316.8$ for $V \leq 450$ gallons $C = 371.8$ for $V > 450$ gallons	Rail/Chemical & Petroleum	pH Adjustment	(21, 22)
Polymer mixing tank mixer	$C = 1.071(V) + 610.915$	Rail/Chemical & Petroleum	DAF	(21, 22)
Polymer pump	$C = 697.2$ for polymers 7622 and 7181 $C = 686$ for polymer 7032	Rail/Chemical & Petroleum Barge/Chemical & Petroleum	DAF Polymer-Assisted Coagulation	(21, 22, 39)
Polymer dilution tank	$C = 0.00038(V)^3 - 0.18828(V)^2 + 32.308(V) - 554.286$	Rail/Chemical & Petroleum	DAF	(21, 22)
Polymer dilution tank mixer	$C = 3.38(V) + 566.510$	Rail/Chemical & Petroleum	DAF	(21, 22)

Table 9-2 (Continued)

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
DAF unit	C = -1.357(GPM)^2 + 291.471(GPM) + 68,163.591	Rail/Chemical & Petroleum	DAF	(21, 22)
DAF compressor	C = 245.317(HP) + 1,998.279	Rail/Chemical & Petroleum	DAF	(21, 22)
Sludge storage tank	C = 2.587(V) + 159.528	Rail/Chemical & Petroleum	DAF	(21, 22)
Pre-engineered building	C = 19,450.08	Rail/Chemical & Petroleum	DAF	(21, 22)
Sludge transfer pump	C = -22.288(HP)^2 + 327.219(HP) + 1,827.999	Rail/Chemical & Petroleum	Oil/Water Separation, Sludge Dewatering	(18, 23, 24)
Sludge storage tank	C = 15,678.49LOG$_{10}$(V) - 40,333.095	Rail/Chemical & Petroleum	Sludge Dewatering	(24)
Organo-clay/activated carbon vessels	C = 2.922(FMC)^2 + 169.642(FMC) + 3,825.433	Rail/Chemical & Petroleum	Organo-Clay/Granular Activated Carbon	(26)
Oil/water separator(gravity separation)	C = 0.234(V) + 16,153	Barge/Chemical & Petroleum	Oil/Water Separation	(27)
Oil/water separator effluent pump, precoat pump, and filter press influent pump	C = 1,928.46 for GPM<2 C = 2,015.98 for GPM<4 C = 2,226.1 for GPM<7.5 C = 3,371.21 for GPM<15 C = 4,784.05 for GPM<30 C = 6,696.73 for GPM≥30	Truck/Chemical & Petroleum Rail/Chemical & Petroleum Barge/Chemical & Petroleum Food	Oil/Water Separator, Filter Press, Sludge Dewatering	(14, 23, 27, 28, 29, 35)
DAF unit	C = 46,000 for GPM<53 C = 68,500 for GPM≥53	Barge/Chemical & Petroleum	DAF	(27)
Sludge storage tank	C = 0.917(V) + 322.7	Barge/Chemical & Petroleum	DAF	(27)
Filter press wastewater effluent storage tank	C = 0.526(V) + 3,246.142	Barge/Chemical & Petroleum	Filter Press	(29)
Precoat storage tank	C = 4,160 for FPV <10 C = 4,544 for FPV <30 C = 5,078 for FPV <50 C = 6,980 FPV <100 C = 10,284 for FPV ≥100	Truck/Chemical & Petroleum Rail/Chemical & Petroleum Barge/Chemical & Petroleum Food	Filter Press, Sludge Dewatering	(14, 23, 28, 29, 35)

Table 9-2 (Continued)

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
Wastewater transfer pump/oil transfer pump (operating at maximum capacity)	$C = 0.0015(GPM)^3 - 0.2463(GPM)^2 + 11.6758(GPM) + 847.0323$	Truck/Chemical & Petroleum Rail/Chemical & Petroleum Barge/Chemical & Petroleum Food	Oil/Water Separation, Biological Treatment	(16, 25, 30, 33, 34)
Preaeration tank	$C = 0.578(V) + 2,142.109$	Truck/Chemical & Petroleum Rail/Chemical & Petroleum Barge/Chemical & Petroleum Food	Biological Treatment	(16, 25, 30, 34)
Diffusers/blowers	$C = 23.443(FT3M) + 787.24$	Truck/Chemical & Petroleum Rail/Chemical & Petroleum Barge/Chemical & Petroleum Food	Biological Treatment	(16, 25, 30, 34)
Biological reactor tank	$C = -0.371(V/1,000)^2 + 475.133(V/1,000) + 2,3000.696$	Truck/Chemical & Petroleum Rail/Chemical & Petroleum Barge/Chemical & Petroleum Food	Biological Treatment	(16, 25, 30, 34)
Clarifier	$C = 0.331(GPM)^2 + 143.329(GPM) + 21,838.385$	Truck/Chemical & Petroleum Rail/Chemical & Petroleum Barge/Chemical & Petroleum Food	Biological Treatment	(16, 25, 30, 34)
Biological treatment optimization labor	$C = 1,036$	Barge/Chemical & Petroleum	Biological Treatment	(40)
Sludge storage and reverse osmosis storage tank	$C = 0.733(V) + 12,170.856$	Truck/Chemical & Petroleum Rail/Chemical & Petroleum Barge/Chemical & Petroleum Food	Biological Treatment, Reverse Osmosis	(16, 25, 30, 31, 34)
Sludge transfer pump	$C = 209.82(HP) + 1,888.2$	Truck/Chemical & Petroleum Rail/Chemical & Petroleum Barge/Chemical & Petroleum Food	Biological Treatment, Sludge Dewatering	(16, 25, 30, 34, 35)

Table 9-2 (Continued)

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
Wastewater pump (effluent from biological treatment)	$C = 3.383(HP)^2 + 64.263(HP) + 1{,}024.711$	Truck/Chemical & Petroleum Rail/Chemical & Petroleum Barge/Chemical & Petroleum Food	Biological Treatment	(16, 25, 30, 34)
Flooded suction tank	$C = -0.0003(V)^2 + 2.9356(V) + 118.68$ for $V \geq 55$ $C = 193$ for $V<55$	Barge/Chemical & Petroleum	Reverse Osmosis	(31)
Reverse osmosis unit	$C = -13.578(GPM)^2 + 2{,}600.9(GPM) + 4{,}773.9$	Barge/Chemical & Petroleum	Reverse Osmosis	(31)
Gravity separator	$C = -0.00002(V)^2 + 1.165(V) + 4748.36$ for $V<21{,}808$ $C = 0.00000006(V)^2 + 0.2849(V) + 10{,}738$ for $V \geq 21{,}808$	Truck/Hopper Rail/Hopper Barge/Hopper Food	Oil/Water Separator, Gravity Separation	(33, 36)

ACV - Activated carbon vessel volume (cubic feet).
API - American Petroleum Institute.
C - Direct capital equipment costs ($1994).
DAF - Dissolved Air Flotation.
FCV - Filter cake volume (cubic feet per day).
FMC - Filter media vessel volume (cubic feet).
FT3M - Flow rate (cubic feet per minute).
GPM - Flow rate (gallons per minute).
HP - Motor horsepower (hp).
FPV - Filter press volume (cubic feet).
V - Tank volume (gallons).

Table 9-3

Components of Total Capital Investment

Item	Component	Cost
1	Equipment capital costs (including required accessories), installation, delivery, electrical and instrumentation, enclosure, and pumping	Direct Capital Cost
2	Piping	10% of item 1
3	Secondary containment/land costs	10% of item 1
4	Excavation and site work	3.5% of item 6
5	Indirect costs including: engineering and supervision, construction expenses, contractor's fee, and contingency	30% of item 6
6	Direct + Indirect Costs	Sum of items 1 through 5 = 1.80 × Direct Capital Cost
7	Start-up costs	$207.2
8	**Total Capital Investment**	**Sum of items 6 and 7 = (1.80 x Direct Capital Cost) + 207.2**

Source: Reference (39).

Table 9-4

Operation and Maintenance Unit Costs Used by the TECI Cost Model

Item	Cost ($1994)/ Cost Equation ($1994)	Practice/ Technology	Reference
Activity			
Contract hauling of bulk wastewater	$0.44/gallon	Contract Haul	(7)
Disposal of waste oil (95% oil, 5% water)	$0.37/gallon	Contract Haul	(7)
Nonhazardous dewatered sludge disposal	$141.01/yd^3 + $4,176/yr for roll-off box rental	Contract Haul	(7)
Nonhazardous undewatered sludge disposal	$0.53-$3.58/gallon (based on volume)	Contract Haul	(7)
Laboratory fee for volatile organic compounds	$459/analysis	Compliance Monitoring	(8)
Laboratory fee for semivolatile organic compounds	$350/analysis	Compliance Monitoring	(39)
Laboratory fee for metals	$598/analysis	Compliance Monitoring	(8)
Laboratory fee for HEM	$35/analysis	Compliance Monitoring	(8)
Laboratory fee for SGT-HEM	$56.67/analysis	Compliance Monitoring	(39)
Laboratory fee for BOD_5	$16/analysis	Compliance Monitoring	(8)
Laboratory fee for COD	$20/analysis	Compliance Monitoring	(8)
Laboratory fee for TSS	$6/analysis	Compliance Monitoring	(40)
Chemicals			
Activated carbon (annual media change-out and regeneration)	$A = 0.00112(ACV)^2 + 11.663(ACV) + 11058.543$	Activated Carbon Adsorption	(17)
Biological treatment microbes	$2.84/lb	Biological Treatment	(16, 25, 30, 34)
Demulsifier	$33.36/gallon	Oil/Water Separator	(10, 11)
Diatomaceous earth	$0.76/lb	Filter Press, Sludge Dewatering	(14, 23, 28, 29, 35)
Organo-clay/activated carbon adsorption (annual media change-out)	$A = -1.785(FMV)^2 + 946.009(FMV) - 450.496$	Organo-Clay/Activated Carbon Adsorption	(25)
Organo-clay/activated carbon disposal (organo-clay incineration and activated carbon regeneration)	$A = 161.429(FMV) + 8464.083$	Organo-Clay/Activated Carbon Adsorption	(26)
Hydrogen peroxide	$0.45-$0.69/lb	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)

Table 9-4 (Continued)

Item	Cost ($1994)/ Cost Equation ($1994)	Practice/ Technology	Reference
Magnesium hydroxide	$0.26-$0.36/lb	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)
Polyalum chloride	$2.53-$4.28/gallon	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)
Polymer	$2.44-$3.00/lb	Chemical Oxidation, Neutralization, Coagulation, Clarification, Biological Treatment	(12, 13, 40)
Polymer 7032	$1.10/lb	DAF	(21, 22)
Polymer 7181	$4.45/lb	DAF	(21, 22)
Polymer 7622	$1.25/lb	DAF	(21, 22)
Sodium hydroxide (50%)	$1.689/gallon	pH Adjustment	(21, 22)
Sulfuric acid (93%)	$0.095-$0.28/lb $1.091/gallon	Chemical Oxidation, Neutralization, Coagulation, Clarification, and pH Adjustment	(12, 13, 21, 22)
Labor Costs			
Flow reduction training	A = (FPT-REG)(0.5)(25.9) for truck tank type A=(FPT-REG)(0.5)(25.9)/(1.7) for rail tank type	Flow Reduction	(5)
Pump operational labor	A = (0.05)(DPY)(25.9)	All	(37)
Pump maintenance labor	A = (0.005)(DPY)(HPD)(25.9)	All	(37)
Oil/water separator (vertical tube coalescing) operational labor	A = (0.05)(DPY)(25.9)	Oil/Water Separator	(10, 11)
Oil/water separator (vertical tube coalescing) maintenance labor	A = (0.005)(HPD)(DPY)(25.9) + ((48)(25.9))	Oil/Water Separator	(10, 11)
Tanks with mixers maintenance labor	A = 103.6 -207.2 (based on tank volume)	Equalization, pH Adjustment, Filter Press, DAF, Biological Treatment, Sludge Dewatering	(9, 14, 20, 21, 22, 23, 28, 29, 30, 32, 35, 38)
Tanks without mixers maintenance labor	A = 414.4 - 828.8 (based on tank volume)	All	(38)
Tank(all) repair labor	A = (0.01)(C)	All	(38)

Table 9-4 (Continued)

Item	Cost ($1994)/ Cost Equation ($1994)	Practice/ Technology	Reference
Filter press operational labor	A = (BPY)(12.95) - (BPY)(25.9) (based on filter press volume)	Filter Press, Sludge Dewatering	(14, 15, 23, 24, 28, 29, 35)
DAF operational labor	A = (1)(DPY)(25.9) - (2)(DPY)(25.9) (based on chemical addition)	DAF	(21, 22, 27)
DAF maintenance and repair labor	A = (0.01)(C) - (0.02)(C) (based on chemical addition)	DAF	(21, 22, 27)
Chemical oxidation, neutralization, coagulation, clarification operational labor	A = (HPD)(DPY)(25.9)	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)
Chemical oxidation, neutralization, coagulation, clarification maintenance and repair labor	A = (32)(25.9)	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)
Activated carbon unit repair labor	A = (0.01)(C)	Activated Carbon Adsorption	(17)
Activated carbon operational labor	A = (0.5)(DPY)(25.9) + 1,295	Activated Carbon Adsorption	(39)
Bag filter operational labor	A = (0.5)(DPY)(25.9)	Activated Carbon Adsorption	(39)
Bag filter maintenance and repair labor	A = (0.01)(C)	Activated Carbon Adsorption	(39)
pH probe maintenance and repair labor	A = (2)(0.01)(C)	pH Adjustment	(21, 22)
Organo-clay/granular activated carbon unit repair labor	A = (0.01)(C)	Organo-Clay/Activated Carbon Adsorption	(25)
Reverse osmosis operational labor	A = (DPY)(25.9)	Reverse Osmosis	(31)
Reverse osmosis maintenance labor	A = 414.4	Reverse Osmosis	(31)
Oil/water separation (API) maintenance labor	A = 414.4	Oil/Water Separation	(18, 19)
Material and Replacement Costs			
Pump materials	A = (0.01)(C)	All	(37)
Chemical oxidation/ neutralization/coagulation/ clarification materials	A = (0.01)(C)	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)
Demulsifier pump materials	A = 15	Oil/Water Separation	(10, 11)
Oil/water separator (vertical tube coalescing) materials	A = 8-25 (based on wastewater flow)	Oil/Water Separation	(10, 11)
Bag filters	A = (2.30)(DPY)	Activated Carbon Adsorption	(39)

Table 9-4 (Continued)

Item	Cost ($1994)/ Cost Equation ($1994)	Practice/ Technology	Reference
Filter press cloths	A = 245-8,100 (based on filter press volume)	Filter Press Sludge Dewatering	(41)
Filter press materials	A = (0.01)(C)	Filter Press Sludge Dewatering	(14, 15, 23, 24, 28, 29, 35)
DAF (with chemical addition) materials	A = (0.01)(C)	DAF	(21, 22)
Annual costs for a building	A = (0.035)(C)	DAF	(21, 22)
pH probe materials	A = 185/0.75	pH Adjustment	(21, 22)
Filter press precoat storage tank materials	A = (0.01)(C)	Filter Press, Sludge Dewatering	(14, 23, 28, 29, 35)
Reverse osmosis membrane replacement	A = $-1.409(GPM)^2 +$ $142.64(GPM) + 707.27$	Reverse Osmosis	(31)
General Costs			
Electricity usage fee	$0.047/ kilowatt-hour	All	(4)
O&M labor rate	$25.90/hour	All	(3)
Water usage fee	$2.98/1,000 gal of water	Flow Reduction	(5)

A - Annual costs ($1994/year).
ACV - Activated carbon vessel volume (cubic feet).
BPY - Filter press batches per year.
C - Direct capital equipment costs ($1994).
DPY - Operating days per year.
DAF - Dissolved Air Flotation.
FMV - Filter media vessel volume (cubic feet).
FPT - Flow per tank (gallons).
GPM - Flow rate (gallons per minute).
HPD - Operating hours per day.
REG - Subcategory median flow per tank (gallons).

Table 9-5

Target Wastewater Flow by Facility Type

Facility Type	Target Flow (gallons/tank)
Truck/Chemical & Petroleum	605
Rail/Chemical & Petroleum	2,091
Truck/Food	790
Rail/Food	4,500
Barge/Food	4,500
Truck/Hopper	144
Rail/Hopper	267
Barge/Hopper	712

Source: Reference (2).

Table 9-6

Cost Summary of Regulatory Options for BPT/BAT/BCT (a)

Subcategory	Option	Capital Cost (Thousand $1994)	O&M Cost (Thousand $/yr (in $1994))
Barge/Chemical & Petroleum	1	$85	$126
Barge/Chemical & Petroleum	2	$1,800	$316
Rail/Chemical & Petroleum	1	$0	$7
Rail/Chemical & Petroleum	2	$184	$35
Rail/Chemical & Petroleum	3	$199	$61
Truck/Chemical & Petroleum	1	$77	$(28)
Truck/Chemical & Petroleum	2	$77	$(28)
Food (b)	1	$0	$0
Food (b)	2	$0	$0
Barge/Hopper (c)	1	$160	$480

Source: Output from the Transportation Equipment Cleaning Industry Design and Cost Model.

(a) Costs are based on monthly monitoring for regulated toxic pollutants and weekly monitoring for regulated conventional pollutants.
(b) All direct dischargers in these subcategories currently operate oil/water separation, equalization, and biological treatment and are expected to meet the pollutant discharge long-term averages without incurring any additional capital or annual costs.
(c) Costs are based on only monthly monitoring for all pollutants.

Table 9-7

Cost Summary of Regulatory Options for PSES (a)

Subcategory	Option	Capital Cost (Thousand $1994)	O&M Cost (Thousand $/yr (in $1994))
Barge/Chemical & Petroleum	1	$0	$61
Barge/Chemical & Petroleum	2	$0	$61
Barge/Chemical & Petroleum	3	$430 (b)	$220 (b)
Rail/Chemical & Petroleum	1	$3,190	$496
Rail/Chemical & Petroleum	2	$7,040	$659
Rail/Chemical & Petroleum	3	$7,540	$1,500
Truck/Chemical & Petroleum	A	$19,300	$5,480
Truck/Chemical & Petroleum	1	$51,400	$8,030
Truck/Chemical & Petroleum	2	$65,400	$23,600
Food	1	$18,100 (c)	$30.6 (c)
Food	2	$96,400 (c)	$61.6 (c)
Barge/Hopper	1	$0 (c)	$26 (c)
Rail/Hopper	1	$0 (c)	$28 (c)
Truck/Hopper	1	$310 (c)	$390 (c)

Source: Output from the Transportation Equipment Cleaning Design and Cost Model.

(a) Costs are based on monthly monitoring of all regulated pollutants.
(b) Costs are based on one facility; however, since proposal, EPA has identified four facilities that previously discharged directly to surface waters and have since either switched or plan to switch discharge status. EPA did not consider Option 3 for PSES or PSNS at proposal; therefore, EPA did not revise compliance costs for this option for the final rule.
(c) EPA did not consider these options for PSES or PSNS at proposal; therefore, EPA did not revise compliance costs for these options for the final rule.

10.0 POLLUTANT REDUCTION ESTIMATES

This section describes EPA's estimates of industry pollutant loadings and pollutant reductions for each of the Transportation Equipment Cleaning Industry (TECI) technology options described in Section 8.0. The Agency estimated pollutant loadings and pollutant reductions at TEC facilities in order to evaluate the impact of pollutant loadings currently released to surface waters and publicly-owned treatment works (POTWs), to evaluate the impact of pollutant loadings released to surface waters and POTWs following implementation of each TECI regulatory option, and to assess the cost-effectiveness of each TECI regulatory option in achieving these pollutant loading reductions. Untreated, baseline, and post-compliance pollutant loadings and pollutant reductions were estimated for pollutants of interest that were treated by the technology bases. The selection of pollutants included in the load removal estimates is discussed below. Untreated, baseline, and post-compliance pollutant loadings are defined as follows:

- Untreated loadings - pollutant loadings in raw transportation equipment cleaning (TEC) wastewater. These loadings represent pollutant loadings generated by the TECI, and do not account for wastewater treatment currently in place at TEC facilities.

- Baseline loadings - pollutant loadings in TEC wastewater currently being discharged to POTWs or U.S. surface waters. These loadings account for wastewater treatment currently in place at TEC facilities.

- Post-compliance loadings - pollutant loadings in TEC wastewater that would be discharged following implementation of each regulatory option. These loadings are calculated assuming that all TEC facilities would operate wastewater treatment technologies equivalent to the technology bases for the regulatory options evaluated.

The following information is presented in this remainder of this chapter:

- Section 10.1 presents the methodology used to identify pollutants included in the load removal estimates;

- Section 10.2 presents the general methodology used to calculate TECI pollutant loadings and pollutant reductions;

- Section 10.3 presents the general methodology used to estimate untreated pollutant loadings in TEC wastewaters;

- Section 10.4 presents the methodology used to estimate untreated production normalized pollutant loadings (PNPLs) in TEC wastewaters for multiple subcategory facilities;

- Section 10.5 presents the estimated untreated pollutant loadings for the TECI;

- Section 10.6 presents the estimated baseline pollutant loadings for the TECI;

- Section 10.7 presents the estimated post-compliance pollutant loadings for the TECI;

- Section 10.8 presents the estimated pollutant loading reductions achieved by the TECI following implementation of each regulatory option; and

- Section 10.9 presents references for this section.

EPA has not directly evaluated pollutant removals for the pollution prevention alternative. EPA believes that pollutant reductions would be equivalent to or exceed the load removals from EPA's regulatory options.

10.1 Methodology Used to Identify Pollutants Included in the Load Removal Estimates

After determining pollutants of interest for each subcategory (discussed in Section 6.6), EPA selected treatment technologies and composed technology options that control the pollutants of interest for each subcategory. Next, EPA gathered influent and effluent sampling data to characterize treatment performance for the options. EPA evaluated the sampling data and determined if a pollutant of interest was treated by one or more of the wastewater treatment technology options evaluated for each subcategory and discharge type (i.e., indirect or direct) by analyzing the percent reduction achieved by the technology option. (The technology options considered for each subcategory are discussed in Section 8.0.) EPA included all pollutants of interest in the load removal estimates that had a removal efficiency greater than 0% by at least one technology option considered by the Agency. The criterion was applied to the base technology option and to each incremental technology option individually. This criterion insures that EPA does not select for regulation pollutants that are not removed or controlled by the technology options considered by the Agency.

If a given pollutant of interest met this criterion, treatment effectiveness concentrations and/or percent removal efficiencies were also calculated. Additional information on identifying pollutants included in the load removal estimates and their corresponding removal rates for each TECI subcategory can be found in reference 1 and reference 2.

10.2 General Methodology Used to Calculate Pollutant Loadings and Pollutant Reductions

In general, pollutant loadings and pollutant reductions were calculated for the TECI using the following methodology:

1. Field sampling data were analyzed to determine pollutant concentrations in untreated TEC wastewaters.

2. These concentrations were converted to untreated PNPLs for each TECI subcategory using the sampled facility production data (i.e., the number of tanks cleaned), wastewater flow rates, and operating data.

3. Untreated PNPLs were used in the TECI cost model (see Section 9.0) to estimate the loading of each pollutant in each model facility untreated TEC wastewater stream.

4. Model facility daily untreated pollutant loadings were converted to untreated influent concentrations using facility flow data and a conversion factor.

5. Model facility untreated pollutant loadings and statistically generated weighting factors were used to calculate untreated wastewater pollutant loadings for the TECI and each TECI subcategory.

6. For each pollutant of interest (see Section 6.6), pollutant removal efficiencies achieved by the treatment technologies that comprise each TECI regulatory option were developed using analytical data collected during EPA's TECI sampling program.

7. Treated effluent concentrations, or treatment effectiveness concentrations, that are achieved by treatment technologies that comprise each TECI regulatory option were developed using analytical data collected during EPA's TECI sampling program.

8. The TECI cost model calculated the pollutant loadings and pollutant loading reductions achieved at baseline. For facilities that have existing treatment, the cost model compared the untreated TEC wastewater influent concentrations to the treatment effectiveness concentrations and percent removal efficiency achieved by existing treatment, and determined the pollutant reductions achieved by the existing treatment.

9. The baseline pollutant concentrations were converted to baseline pollutant loadings using facility flow rates and a conversion factor.

10. TECI and TECI subcategory baseline pollutant loadings were calculated for each regulatory option using the model facility baseline pollutant loadings and statistically generated weighting factors.

11. The TECI cost model calculated the post-compliance pollutant loadings and pollutant reductions achieved by each regulatory option. As discussed in Section 8.0, each TECI regulatory option is comprised of a set of pollutant control technologies. For each facility and for each treatment unit, the cost model compared the pollutant concentrations in the wastewater influent to the treatment effectiveness concentration and/or the pollutant percent removal efficiency achieved by the treatment unit, and then determined the pollutant reductions achieved.

12. The post-compliance pollutant concentrations were converted to post-compliance pollutant loadings using facility flow rates and a conversion factor.

13. TECI and TECI subcategory post-compliance pollutant loadings were calculated for each regulatory option using the model facility post-compliance pollutant loadings and statistically generated weighting factors.

14. For each model facility, the pollutant reductions achieved by each regulatory option were calculated by subtracting the post-compliance pollutant loadings from the baseline pollutant loadings.

15. TECI and TECI subcategory pollutant reductions achieved by each regulatory option were calculated using the model facility pollutant reductions and statistically generated weighting factors.

10.3 General Methodology Used to Estimate Untreated Pollutant Loadings

The Agency used analytical data collected during EPA's TECI sampling program to calculate untreated PNPLs for pollutants of interest that were removed by the regulatory options evaluated for each TECI subcategory. The following table lists the number of untreated wastewater characterization samples collected and analyzed for each TECI subcategory:

Subcategory	Number of Untreated Wastewater Characterization Samples Collected	Number of Facilities Sampled
Truck/Chemical & Petroleum	10	5
Rail/Chemical & Petroleum	5	2
Barge/Chemical & Petroleum	10	3
Food	7	3
Truck/Hopper	0	0
Rail/Hopper	0	0
Barge/Hopper	1	1

Note that although some analytical data were available from facility responses to the Detailed Questionnaire, these data were not useable for one or more of the following reasons: (1) the data provided represented samples collected at a variety of treatment system influent/effluent points that may not correspond to the technology options considered as the bases for regulation; (2) the data provided were an average estimated by the facility over one or more sampling days, rather than individual analytical results as required for statistical analyses; and (3) analytical quality assurance/quality control (QA/QC) data were not provided, prohibiting an assessment of the data quality. No untreated wastewater characterization data were submitted in comments on the proposed rule and notice of availability.

For each facility sampled, data on facility production (i.e., number of tanks cleaned per day), cargo types cleaned, TEC wastewater flow rate, operating hours per day, and operating days per year were collected. These data were used in conjunction with the untreated wastewater analytical data to calculate PNPLs for each subcategory using the methodology described below.

EPA first calculated PNPLs for each untreated wastewater sample collected at each facility using the following equation:

$$L_i = \frac{C_i \times cf \times F}{T} \tag{1}$$

where:

i	=	Pollutant *i* in waste stream
L_i	=	Pollutant loading generated per tank cleaned (milligram/tank or microgram/tank, depending on the pollutant)
C_i	=	Pollutant concentration in TEC wastewater characterization sample (milligram/liter or microgram/liter, depending on the pollutant)
cf	=	Conversion factor (liters per gallon)
F	=	Daily flow rate (gallons/day); gallons per year calculated by multiplying the flow in gallons per day by the number of operating days per year
T	=	Number of tanks cleaned per day; the number of tanks cleaned per year was calculated by multiplying the number of tanks cleaned per day by the number of operating days per year

Certain pollutants were not detected above the sample detection limits in some wastewater samples. Because both nondetect and detect results represent the variability of pollutant concentrations in TEC wastewater, both results were included in calculating PNPLs. For nondetect results, EPA assumed the pollutant concentration was equal to the sample detection limit for that pollutant. EPA based this assumption on the expectation that the pollutant was present in TEC wastewater, albeit at a concentration less than the sample detection limit.

If duplicate samples or multiple grab samples (e.g., for HEM and SGT-HEM analyses) of untreated wastewater were collected at a facility, EPA calculated the daily average PNPL for each pollutant at that facility using the following equation:

$$DL_i = \frac{\sum_{j=\text{Sample 1}}^{N} L_{i,j}}{N} \qquad (2)$$

where:

DL_i	=	Daily average pollutant loading generated per tank cleaned (milligram/tank or microgram/tank, depending on the pollutant)
i	=	Pollutant *i* in waste stream
$L_{i,j}$	=	Pollutant loading generated per tank cleaned for sample (milligram/tank or microgram/tank, depending on the pollutant)
j	=	Counter for number of duplicate or grab samples collected
N	=	Number of duplicate or grab samples collected

In cases where EPA collected samples from the same sampling point at the same facility over multiple sampling days, EPA calculated a facility average PNPL using the following equation:

$$FL_i = \frac{\sum_{j=\text{Day 1}}^{\text{Day N}} L_{i,j} \text{ (or } DL_{i,j}\text{)}}{N} \qquad (3)$$

where:

FL_i	=	Facility-specific average pollutant loading generated per tank cleaned (milligram/tank or microgram/tank, depending on the pollutant)
i	=	Pollutant *i* in waste stream
$L_{i,j}$	=	Pollutant loading generated per tank cleaned on Day j (milligram/tank or microgram/tank, depending on the pollutant)

$DL_{i,j}$ = Daily average pollutant loading generated per tank cleaned on Day j (milligram/tank or microgram/tank, depending on the pollutant)

j = Counter for number of days of sampling at a specific facility

N = Number of sampling days at a specific facility

Finally, EPA calculated subcategory PNPLs by averaging the applicable average facility-specific PNPLs as shown in the equation below. This methodology ensured that pollutant data from each sampled facility were weighted equally in calculating the subcategory PNPLs, regardless of the number of wastewater samples collected at each facility.

$$PNPL_i = \frac{\sum_{j=\text{Facility } 1}^{\text{Facility } N} FL_{i,j}}{N} \tag{4}$$

where:

$PNPL_i$ = Subcategory average production normalized pollutant loading generated per tank cleaned (milligram/tank or microgram/tank, depending on the pollutant)

i = Pollutant *i* in waste stream

$FL_{i,j}$ = Facility-specific average pollutant loading generated per tank cleaned (milligram/tank or microgram/tank, depending on the pollutant)

j = Counter for number of facilities sampled for a specific subcategory

N = Number of facilities sampled for a specific subcategory

Additional information on the calculation of untreated PNPLs for each TECI subcategory can be found in reference 3.

10.4 Multiple Subcategory Facility PNPLs

Some modeled facilities have production in more than one subcategory. For example, a facility that cleans both tank trucks and rail tank cars that last transported chemical cargos has production in both the Truck/Chemical & Petroleum and the Rail/Chemical & Petroleum Subcategories. To simplify compliance cost and pollutant reduction estimates, EPA assigned each multiple subcategory facility to a single primary subcategory. As a result of this simplification, EPA modeled control of all TEC wastewater generated by multiple subcategory facilities using the technology options evaluated for the facility's primary subcategory (rather than segregating and treating the waste streams in separate wastewater treatment systems). EPA accounted for untreated TEC wastewater pollutant loadings from other secondary subcategories by using the PNPLs from secondary subcategory wastewater for those pollutants that were also pollutants of interest for the primary subcategory. Estimation of pollutant reductions for multiple subcategory facilities is described in greater detail in the rulemaking record.

10.5 TECI Untreated Pollutant Loadings

TECI untreated pollutant loadings represent the industry pollutant loadings before accounting for pollutant removal by treatment technologies already in place at TEC facilities. The Agency estimated untreated pollutant loadings generated by model facilities using the untreated PNPLs developed for each stream type (i.e., PNPLs for tank trucks cleaned at Truck/Chemical & Petroleum Subcategory facilities, etc.) and the number of tanks cleaned per year at each model facility.

The model facility untreated wastewater pollutant loadings were then weighted using statistically derived weighting factors for each model facility. The weighted model facility loadings were then summed to estimate untreated pollutant loadings for each subcategory and the entire TECI. Tables 10-1 through 10-10 present total industry untreated pollutant loadings by pollutant and discharge status for each subcategory.

10.6 TECI Baseline Pollutant Loadings

TECI baseline loadings represent the pollutant loadings currently discharged by TEC facilities to U.S. surface waters or to POTWs after accounting for removal of pollutants by existing on-site treatment. Section 9.2.5 describes the assessment of the treatment in place at each model TEC facility. The model facility baseline pollutant loadings were calculated as the difference between the model facility untreated wastewater pollutant loadings calculated as described in Section 10.5 and the pollutant reductions achieved by treatment in place at each TECI model facility.

The model facility baseline pollutant loadings were then weighted using the statistically derived weighting factors for each model facility. The weighted model facility baseline loadings were then summed to estimate the baseline pollutant loadings for the entire TECI. Tables 10-1 through 10-10 present the total industry baseline pollutant loadings by pollutant and discharge status for each subcategory.

10.7 TECI Post-Compliance Pollutant Loadings by Regulatory Option

TECI post-compliance pollutant loadings represent the pollutant loadings that would be discharged following implementation of the regulatory options. Model facility post-compliance pollutant loadings were calculated using the following steps. First, model facility baseline pollutant loadings were calculated as described in Section 10.6. Second, these loadings were converted to baseline pollutant effluent concentrations for each model facility using the baseline pollutant loadings, the facility process wastewater flow, and a conversion factor. Third, the baseline pollutant effluent concentrations were compared to the effluent concentrations achieved by each regulatory option. Finally, the lower of these concentrations was used along with the facility flow and an appropriate conversion factor to determine the model facility post-compliance pollutant loadings for each regulatory option.

The model facility post-compliance pollutant loadings were then weighted using the statistically derived weighting factors for each model facility. The weighted model facility post-compliance pollutant loadings were then summed to estimate the post-compliance pollutant loadings for the entire TECI. Tables 10-1 through 10-10 present the total industry post-compliance pollutant loadings by pollutant and discharge status for each subcategory.

10.8 TECI Pollutant Loading Reduction Estimates

The pollutant loading reductions represent the pollutant removal achieved through implementation of the regulatory options. Therefore, the pollutant loading reductions are the difference between the post-compliance pollutant loadings and the baseline pollutant loadings for each regulatory option considered. Estimated pollutant loading reductions achieved by each regulatory option are described below by regulation and are shown in Tables 10-1 through 10-10.

10.8.1 BPT

Table 10-11 summarizes pollutant loading reductions for each TECI regulatory option considered for BPT. Although EPA developed a BPT option for the Truck/Hopper and Rail/Hopper Subcategories, pollutant reductions for this option were not estimated for these subcategories because none of the model facilities in these subcategories are direct dischargers.

Tables 10-1 through 10-4 present the BPT pollutant loading reduction estimates for all pollutants and regulatory options for the following subcategories:

- Truck/Chemical & Petroleum Subcategory (Table 10-1);
- Rail/Chemical & Petroleum Subcategory (Table 10-2);
- Barge/Chemical & Petroleum Subcategory (Table 10-3); and
- Barge/Hopper Subcategory (Table 10-4).

As discussed in Section 9.2.9, EPA did not use the cost model to estimate compliance costs for direct dischargers in the Barge/Chemical & Petroleum Subcategory. In addition, EPA did not use the cost model to estimate pollutant loadings and reductions for this subcategory for the same reasons discussed in Section 9.2.9. Because EPA used BOD and/or COD baseline concentrations as indicators for treatment of other pollutants of interest, EPA did not estimate baseline loadings and removals for other pollutants of interest.

Furthermore, EPA did not re-evaluate Option 2 pollutant loadings and removals for the Barge/Chemical & Petroleum Subcategory because this option was determined to not represent the average of the best treatment (because it is not commonly used in the industry) for the proposed rule. The Proposed Technical Development Document presents baseline and option loadings and removals for all options considered at proposal, including Option 2 (4). Note that these loadings are not representative of the current state of the industry (because several facilities have changed discharge status) and EPA's available sampling data; however, the loadings demonstrate the pollutant reduction capacity of Option 2.

10.8.2 BCT

BCT options developed and evaluated by EPA are identical to those developed and evaluated for BPT. Therefore, BCT pollutant loading reductions are identical to the BPT pollutant loading reductions for conventional pollutants discussed in Section 10.8.1.

10.8.3 BAT

BAT options developed and evaluated by EPA are identical to those developed and evaluated for BPT. Therefore, BAT pollutant loading reductions are identical to the BPT pollutant loading reductions for priority and nonconventional pollutants discussed in Section 10.8.1.

10.8.4 PSES

Table 10-12 summarizes pollutant loading reductions for each TECI regulatory option considered for PSES.

Tables 10-5 through 10-10 present the PSES pollutant loading reduction estimates for all pollutants and regulatory options for the following subcategories:

- Truck/Chemical & Petroleum Subcategory (Table 10-5);
- Rail/Chemical & Petroleum Subcategory (Table 10-6);
- Food Subcategory (Table 10-7);
- Truck/Hopper Subcategory (Table 10-8);
- Rail/Hopper Subcategory (Table 10-9); and
- Barge/Hopper Subcategory (Table 10-10).

As discussed in Section 9.2.9, based on a review of current operating and discharge monitoring data (e.g., BOD and/or COD) for EPA's model facilities in the Barge/Chemical & Petroleum Subcategory, EPA believes that all model indirect discharging facilities are meeting levels of control that would be established under PSES Options 1 and 2. Consequently, EPA estimates zero load reductions associated with these options. EPA believes there may be some additional removals associated with PSES Option 3; however, EPA believes that this option would not result in a significant reduction of toxic pollutants because most pollutants are already treated to very low levels based on the Option 2 level of control. EPA did not re-evaluate Option 3 pollutant loadings and removals for this subcategory because this option was rejected for the proposed rule because of small incremental removals achieved by this option. The Proposed Development Document presents baseline and option loadings and removals for all options considered at the proposal, including Option 3 (4). Note that these loadings are not representative of the current state of the industry (because several facilities have changed discharge status) and EPA's available sampling data; however, the loadings demonstrate the pollutant reduction capacity of Option 2 and Option 3.

10.9 References[1]

1. Eastern Research Group, Inc. Development of Final Removal Efficiencies and Treatment Effectiveness Concentrations for Regulated Subcategories. Memorandum from Melissa Cantor, Eastern Research Group, Inc. to the TECI Rulemaking Record. March 28, 2000 (DCN T20513).

2. Eastern Research Group, Inc. Development of Treatment Effectiveness Concentrations and Percent Removals. Memorandum from Grace Kitzmiller, Eastern Research Group, Inc. to the TECI Rulemaking Record. April 29, 1998 (DCN T09764).

3. Eastern Research Group, Inc. Development of Transportation Equipment Cleaning Industry Production Normalized Pollutant Loadings. Memorandum from Grace Kitzmiller, Eastern Research Group, Inc. to the TECI Rulemaking Record. May 6, 1998 (DCN T09981).

4. U.S. Environmental Protection Agency, Office of Water. Development Document for Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Category. EPA-821-B-98-011, May 1998.

[1]For those references included in the administrative record supporting the TECI rulemaking, the document control number (DCN) is included in parentheses at the end of the reference.

Table 10-1

Truck/Chemical & Petroleum Subcategory – Direct Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals							
5-Day Biochemical Oxygen Demand	NA	420,000	930	920	920	8.6	8.6
Oil and Grease (HEM)	NA	250,000	700	700	700	6.5	6.5
Total Suspended Solids	NA	230,000	3,400	3,400	3,400	32	32
Bulk Nonconventionals							
Chemical Oxygen Demand	NA	1,000,000	36,000	35,000	35,000	330	330
Total Organic Carbon	NA	240,000	27,000	27,000	27,000	250	250
Total Petroleum Hydrocarbons (SGT-HEM)	NA	23,000	640	640	640	6.0	6.0
Nonconventional Metals							
Aluminum	7429905	1,100	25	25	25	<1	< 1
Boron	7440428	580	35	35	35	<1	< 1
Iron	7439896	3,300	120	120	120	1.1	1.1
Manganese	7439965	170	27	27	27	<1	< 1
Phosphorus	7723140	9,800	2,800	2,700	2,700	26	26
Silicon	7440213	2,300	660	660	660	6.2	6.2
Tin	7440315	2,100	830	820	820	7.7	7.7
Titanium	7440326	34	2.5	2.4	2.4	<1	< 1
TOTAL Nonconventional Metals		**19,000**	**4,500**	**4,400**	**4,400**	**41**	**41**

Table 10-1 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Nonconventional Organics							
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822469	< 1	< 1	< 1	< 1	< 1	< 1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562394	< 1	< 1	< 1	< 1	< 1	< 1
2,4,5-T	93765	< 1	< 1	< 1	< 1	< 1	< 1
2-Methylnaphthalene	91576	13	1.3	1.3	1.3	< 1	< 1
2-Isopropylnaphthalene	2027170	33	1.3	1.3	1.3	< 1	< 1
2,4-DB (Butoxon)	94826	1.3	1.2	1.2	1.2	< 1	< 1
2,4,5-TP	93721	< 1	< 1	< 1	< 1	< 1	< 1
Acetone	67641	5,100	300	300	300	< 1	< 1
Adsorbable Organic Halides (AOX)	59473040	810	79	79	79	< 1	< 1
alpha-Terpineol	98555	45	1.3	1.3	1.3	< 1	< 1
Azinphos Methyl	86500	< 1	< 1	< 1	< 1	< 1	< 1
Benzoic Acid	65850	4,300	270	270	270	< 1	< 1
Benzyl Alcohol	100516	49	2.5	2.5	2.5	< 1	< 1
Dalapon	75990	< 1	< 1	< 1	< 1	< 1	< 1
Diallate	2303164	3.8	< 1	< 1	< 1	< 1	< 1
Dimethyl Sulfone	67710	1,300	1.3	1.3	1.3	< 1	< 1
Leptophos	21609905	1.0	< 1	< 1	< 1	< 1	< 1
m-Xylene	108383	360	1.3	1.3	1.3	< 1	< 1
MCPA	94746	100	34	34	34	< 1	< 1
Methyl Ethyl Ketone	78933	920	18	18	18	< 1	< 1
Methyl Isobutyl Ketone	108101	350	21	21	21	< 1	< 1

Table 10-1 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
n-Octadecane	593453	71	1.3	1.3	1.3	< 1	< 1
n-Triacontane	638686	39	1.3	1.3	1.3	< 1	< 1
n-Tetradecane	629594	89	1.3	1.3	1.3	< 1	< 1
n-Decane	124185	63	1.3	1.3	1.3	< 1	< 1
n-Docosane	629970	19	1.3	1.3	1.3	< 1	< 1
n-Dodecane	112403	200	1.3	1.3	1.3	< 1	< 1
n-Eicosane	112958	55	1.3	1.3	1.3	< 1	< 1
n-Hexacosane	630013	26	1.3	1.3	1.3	< 1	< 1
n-Hexadecane	544763	130	1.3	1.3	1.3	< 1	< 1
n-Tetracosane	646311	33	1.3	1.3	1.3	< 1	< 1
o-Cresol	95487	13	1.7	1.7	1.7	< 1	< 1
o+p-Xylene	136777612	180	1.3	1.3	1.3	< 1	< 1
Octachlorodibenzo-p-dioxin	3268879	< 1	< 1	< 1	< 1	< 1	< 1
p-Cresol	106445	13	1.7	1.7	1.7	< 1	< 1
p-Cymene	99876	10	1.3	1.3	1.3	< 1	< 1
Pentachloronitrobenzene	82688	1.4	< 1	< 1	< 1	< 1	< 1
Styrene	100425	570	1.7	1.7	1.7	< 1	< 1
Total Phenols	NA	390	230	230	230	2.2	2.2
TOTAL Nonconventional Organics		**15,000**	**990**	**990**	**990**	**3.7**	**3.7**

Table 10-1 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Other Nonconventionals							
Fluoride	16984488	3,600	2,400	2,300	2,300	22	22
Nitrate/Nitrite	NA	320	90	89	89	< 1	< 1
Total Phosphorus	14265442	4,600	1,200	1,200	1,200	12	12
Surfactants (MBAS)	NA	3,000	130	130	130	1.2	1.2
TOTAL Other Nonconventionals		**12,000**	**3,800**	**3,800**	**3,800**	**35**	**35**
Priority Metals							
Chromium	7440473	350	2.5	2.5	2.5	< 1	< 1
Copper	7440508	43	11	11	11	< 1	< 1
Mercury	7439976	< 1	< 1	< 1	< 1	< 1	< 1
Zinc	7440666	100	2.6	2.5	2.5	< 1	< 1
TOTAL Priority Metals		**490**	**16**	**16**	**16**	**< 1**	**< 1**
Priority Organics							
1,2-Dichloroethane	107062	98	1.6	1.6	1.6	< 1	< 1
1,1,1-Trichloroethane	71556	130	1.3	1.3	1.3	< 1	< 1
1,2-Dichlorobenzene	95501	18	1.3	1.3	1.3	< 1	< 1
2-Chlorophenol	95578	11	1.7	1.7	1.7	< 1	< 1
Benzene	71432	6.4	1.3	1.3	1.3	< 1	< 1
beta-BHC	319857	< 1	< 1	< 1	< 1	< 1	< 1
Bis (2-ethylhexyl) Phthalate	117817	92	1.3	1.3	1.3	< 1	< 1
Chloroform	67663	12	1.3	1.3	1.3	< 1	< 1

Table 10-1 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Di-n-Octyl Phthalate	117840	30	1.3	1.3	1.3	< 1	< 1
Ethylbenzene	100414	81	1.3	1.3	1.3	< 1	< 1
Methylene Chloride	75092	2,000	220	210	210	2.0	2.0
Naphthalene	91203	55	1.3	1.3	1.3	< 1	< 1
Tetrachloroethylene	127184	200	1.3	1.3	1.3	< 1	< 1
Toluene	108883	310	1.3	1.3	1.3	< 1	< 1
Trichloroethylene	79016	3.6	1.8	1.8	1.8	< 1	< 1
TOTAL Priority Organics		**3,100**	**230**	**230**	**230**	**2.2**	**2.2**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.
Note: EPA did not revise the pollutant loadings and reductions to include 18 additional pollutants of interest and the final pollutant removal methodology because these additional pollutant removals would have an insignificant impact on the total load removals.

Table 10-2

Rail/Chemical & Petroleum Subcategory – Direct Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals									
5-Day Biochemical Oxygen Demand	NA	8,200	62	62	62	55	0	0	7.5
Oil and Grease (HEM)	NA	3,600	50	50	28	28	0	22	22
Total Suspended Solids	NA	2,400	85	85	85	23	0	0	62
Bulk Nonconventionals									
Chemical Oxygen Demand	NA	19,000	770	770	770	760	0	0	15
Total Dissolved Solids	NA	37,000	34,000	34,000	25,000	21,000	0	9,200	13,000
Total Organic Carbon	NA	4,500	770	770	540	510	0	230	260
Total Petroleum Hydrocarbons (SGT-HEM)	NA	860	87	87	28	28	0	59	59
Nonconventional Metals									
Aluminum	7429905	55	23	23	12	< 1	0	10	22
Barium	7440393	3.4	3.3	3.3	1.1	1.1	0	2.2	2.2
Boron	7440428	8.6	7.6	7.6	6.3	5.5	0	1.4	2.1
Calcium	7440702	170	130	130	130	130	0	2.7	2.7
Iron	7439896	70	70	70	< 1	< 1	0	69	69
Magnesium	7439954	69	57	57	55	55	0	1.7	1.7
Manganese	7439965	3.5	2.9	2.9	1.9	1.9	0	< 1	< 1
Phosphorus	7723140	56	45	45	8.5	5.7	0	36	39
Potassium	7440097	4,500	4,200	4,200	3,300	3,100	0	890	1,100
Silicon	7440213	57	57	57	39	39	0	18	18

Table 10-2 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Sodium	7440235	7,800	6,900	6,900	4,900	4,800	0	1,900	2,100
Sulfur	7704349	2,200	2,000	2,000	1,500	1,300	0	450	620
Titanium	7440326	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
TOTAL Nonconventional Metals		**15,000**	**13,000**	**13,000**	**10,000**	**9,500**	**0**	**3,400**	**3,900**
Nonconventional Organics									
1-Methylphenanthrene	832699	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
2,4-Diaminotoluene	95807	7.3	7.3	7.3	6.9	< 1	0	< 1	6.7
2,4,5-TP	93721	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
2,4,5-T	93765	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
2,4-DB (Butoxon)	94826	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Acephate	30560191	3.0	2.9	2.9	2.5	< 1	0	< 1	2.8
Acetone	67641	2.1	< 1	< 1	< 1	< 1	0	0	0
Adsorbable Organic Halides (AIX)	59473040	5.3	1.7	1.7	1.6	1.2	0	< 1	< 1
Benefluralin	1861401	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Benzoic Acid	65850	7.8	< 1	< 1	< 1	< 1	0	0	< 1
Carbazole	86748	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Dacthal (DCPA)	1861321	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Diallate	2303164	1.3	< 1	< 1	< 1	< 1	0	< 1	< 1
Dicamba	1918009	2.0	1.9	1.9	< 1	< 1	0	1.9	1.9
Dichloroprop	120365	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Dimethyl Sulfone	67710	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Dinoseb	88857	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Gamma-chlordane	5103742	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Hexanoic Acid	142621	11	11	11	6.0	6.0	0	4.9	4.9

Table 10-2 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
m-Xylene	108383	< 1	< 1	< 1	< 1	< 1	0	0	0
MCPP	7085190	130	130	130	15	< 1	0	110	130
Methyl Ethyl Ketone	78933	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
n-Triacontane	638686	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
n-Tetracosane	646311	1.0	< 1	< 1	< 1	< 1	0	< 1	< 1
n-Tetradecane	629594	6.5	< 1	< 1	< 1	< 1	0	0	0
n-Octadecane	593453	5.7	< 1	< 1	< 1	< 1	0	0	0
n-Docosane	629970	1.2	< 1	< 1	< 1	< 1	0	0	0
n-Octacosane	630024	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
n-Dodecane	112403	1.7	< 1	< 1	< 1	< 1	0	0	0
n-Eicosane	112958	4.9	< 1	< 1	< 1	< 1	0	0	0
n-Hexadecane	544763	9.4	< 1	< 1	< 1	< 1	0	0	0
n-Hexacosane	630013	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
o+p-Xylene	136777612	< 1	< 1	< 1	< 1	< 1	0	0	0
Octachlorodibenzo-p-dioxin	3268879	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Octachlorodibenzofuran	39001020	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
p-Cresol	106445	< 1	< 1	< 1	< 1	< 1	0	0	< 1
Pentachloronitrobenzene	82688	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Propachlor	1918167	< 1	< 1	< 1	< 1	< 1	0	0	0
Propazine	139402	< 1	< 1	< 1	< 1	< 1	0	0	< 1
Styrene	100425	< 1	< 1	< 1	< 1	< 1	0	0	0
Terbacil	5902512	< 1	< 1	< 1	< 1	< 1	0	0	0
Terbuthylazine	5915413	9.4	9.3	9.3	6.7	< 1	0	2.6	9.3

Table 10-2 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Total Phenols	NA	2.5	1.8	1.8	1.2	< 1	0	< 1	1.6
TOTAL Nonconventional Organics		**220**	**170**	**170**	**43**	**11**	**0**	**130**	**160**
Other Nonconventionals									
Ammonia as Nitrogen	7664417	180	33	33	33	28	0	0	4.6
Chloride	16887006	5,700	5,400	5,400	3,900	3,900	0	1,500	1,500
Fluoride	16984488	10	10	10	6.9	3.1	0	3.4	7.2
Nitrate/Nitrite	NA	27	9.7	9.7	9.7	5.3	0	0	4.5
Surfactants (MBAS)	NA	11	11	11	4.2	2.0	0	6.8	8.9
Total Phosphorus	14265442	57	41	41	7.8	3.0	0	33	38
TOTAL Other Nonconventionals		**6,000**	**5,500**	**5,500**	**4,000**	**4,000**	**0**	**1,500**	**1,500**
Priority Metals									
Arsenic	7440382	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Chromium	7440473	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Copper	7440508	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Zinc	7440666	2.1	1.5	1.5	< 1	< 1	0	1.4	1.4
TOTAL Priority Metals		**3.0**	**2.4**	**2.4**	**< 1**	**< 1**	**0**	**1.9**	**2.0**
Priority Organics									
alpha-BHC	319846	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Anthracene	120127	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
beta-BHC	319857	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
delta-BHC	319868	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Dieldrin	60571	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Endosulfan Sulfate	1031078	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Ethylbenzene	100414	< 1	< 1	< 1	< 1	< 1	0	0	0

Table 10-2 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Fluoranthene	206440	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Naphthalene	91203	< 1	< 1	< 1	< 1	< 1	0	0	0
Phenanthrene	85018	1.1	< 1	< 1	< 1	< 1	0	< 1	< 1
Phenol	108952	1.8	< 1	< 1	< 1	< 1	0	< 1	< 1
Pyrene	129000	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
TOTAL Priority Organics		**5.0**	**< 1**	**< 1**	**< 1**	**< 1**	**0**	**< 1**	**< 1**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 10-3

Barge/Chemical & Petroleum Subcategory – Direct Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals							
5-Day Biochemical Oxygen Demand	NA	2,300,000	22,000	6,200	< 6,200	16,000	> 16,000
Total Suspended Solids	NA	760,000	5,400	2,100	< 2,100	3,300	> 3,300
Bulk Nonconventionals							
Chemical Oxygen Demand	NA	14,000,000	150,000	77,000	< 77,000	69,000	> 69,000

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 10-4

Barge/Hopper Subcategory – Direct Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals					
Total Suspended Solids	NA	28,000	19,000	10,000	8,600
Bulk Nonconventionals					
Chemical Oxygen Demand	NA	44,000	8,700	6,000	2,700
Nonconventional Metals					
Aluminum	7429905	300	210	95	110
Calcium	7440702	5,400	3,800	2,100	1,700
Iron	7439896	1,800	1,200	500	670
Manganese	7439965	55	38	18	20
Titanium	7440326	8.6	6.0	1.8	4.2
TOTAL Nonconventional Metals		**7,600**	**5,200**	**2,700**	**2,500**
Priority Metals					
Beryllium	7440417	< 1	< 1	< 1	< 1
Chromium	7440473	2.5	1.7	1.5	< 1
Zinc	7440666	15	3.4	1.8	1.6
TOTAL Priority Metals		**18**	**5.2**	**3.4**	**1.8**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.
Note: Load reductions include a high bias because some facilities included in the pollutant reduction analysis would be excluded because of low flow. In addition, EPA did not revise the pollutant loadings to include additional pollutants of interest and the final pollutant removal methodology because these additional pollutant removals would have an insignificant impact on the total load removals.

Table 10-5

Truck/Chemical & Petroleum Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option A Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option A Pollutant Reductions from Baseline (lbs/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals									
5-Day Biochemical Oxygen Demand	NA	18,000,000	9,900,000	8,200,000	790,000	790,000	1,800,000	9,100,000	9,100,000
Oil and Grease (HEM)	NA	11,000,000	6,400,000	190,000	170,000	170,000	6,200,000	6,300,000	6,300,000
Total Suspended Solids	NA	9,800,000	5,300,000	4,000,000	350,000	130,000	1,300,000	5,000,000	5,200,000
Bulk Nonconventionals									
Chemical Oxygen Demand	NA	45,000,000	29,000,000	28,000,000	12,000,000	5,000,000	1,600,000	17,000,000	24,000,000
Total Dissolved Solids	NA	30,000,000	30,000,000	30,000,000	30,000,000	20,000,000	73,000	73,000	10,000,000
Total Organic Carbon	NA	11,000,000	9,100,000	8,900,000	7,600,000	1,200,000	250,000	1,500,000	8,000,000
Total Petroleum Hydrocarbons (SGT-HEM)	NA	1,000,000	620,000	63,000	60,000	60,000	560,000	560,000	560,000
Nonconventional Metals									
Aluminum	7429905	48,000	27,000	15,000	2,600	550	12,000	25,000	27,000
Boron	7440428	25,000	22,000	21,000	18,000	1,500	66	3,500	20,000
Calcium	7440702	1,900,000	1,700,000	1,700,000	1,500,000	1,200,000	22,000	240,000	520,000
Iron	7439896	140,000	81,000	41,000	5,100	1,000	40,000	76,000	80,000
Magnesium	7439954	450,000	270,000	180,000	58,000	56,000	92,000	210,000	210,000
Manganese	7439965	4,000	1,900	920	570	570	970	1,300	1,300
Molybdenum	7439987	600	530	510	450	450	24	81	81
Phosphorus	7723140	430,000	260,000	210,000	79,000	54,000	52,000	180,000	210,000
Potassium	7440097	200,000	180,000	180,000	160,000	160,000	470	17,000	17,000
Silicon	7440213	100,000	62,000	51,000	20,000	16,000	11,000	42,000	46,000

Table 10-5 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option A Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option A Pollutant Reductions from Baseline (lbs/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Sodium	7440235	6,600,000	6,400,000	6,300,000	6,100,000	4,200,000	16,000	210,000	2,200,000
Strontium	7440246	15,000	13,000	12,000	11,000	11,000	680	1,900	1,900
Sulfur	7704349	3,000,000	3,000,000	3,000,000	3,000,000	2,200,000	7,300	7,300	850,000
Tin	7440315	93,000	69,000	64,000	43,000	6,400	4,700	26,000	62,000
Titanium	7440326	1,500	840	430	91	52	410	750	790
TOTAL Nonconventional Metals		**13,000,000**	**12,000,000**	**12,000,000**	**11,000,000**	**7,800,000**	**260,000**	**1,000,000**	**4,200,000**
Nonconventional Organics									
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822469	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562394	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
2,4-D	94757	22	18	18	15	15	< 1	3.3	3.3
2,4,5-T	93765	6.8	3.8	3.8	1.1	< 1	< 1	2.7	3.1
2-Methylnaphthalene	91576	550	330	160	55	55	170	280	280
2-Isopropylnaphthalene	2027170	1,400	790	540	55	55	240	730	730
2,4-DB (Butoxon)	94826	50	39	39	30	14	< 1	9.3	25
2,4,5-TP	93721	4.8	3.2	3.2	1.8	1.8	< 1	1.4	1.4
Acetone	67641	220,000	190,000	190,000	160,000	40,000	590	34,000	150,000
Adsorbable Organic Halides (AOX)	59473040	35,000	21,000	20,000	6,600	3,000	1,300	15,000	18,000
alpha-Terpineol	98555	2,000	1,400	1,300	770	55	33	610	1,300
Azinphos Methyl	86500	33	19	19	5.9	5.9	< 1	14	14
Benzoic Acid	65850	190,000	170,000	170,000	150,000	64,000	470	16,000	100,000
Benzyl Alcohol	100516	2,100	1,200	940	110	84	230	1,100	1,100
Dalapon	75990	7.1	7.1	7.1	7.1	2.5	< 1	< 1	4.6
Diallate	2303164	150	87	86	29	13	< 1	58	73

Table 10-5 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option A Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option A Pollutant Reductions from Baseline (lbs/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Dimethyl Sulfone	67710	58,000	31,000	19,000	55	55	11,000	31,000	31,000
Dinoseb	88857	17	15	15	13	13	< 1	1.9	1.9
Leptophos	21609905	45	29	28	11	11	< 1	18	18
m-Xylene	108383	16,000	8,100	8,000	720	55	48	7,300	8,000
MCPA	94746	4,500	2,900	950	790	570	2,000	2,200	2,400
Methyl Ethyl Ketone	78933	40,000	35,000	35,000	30,000	3,600	100	5,000	31,000
Methyl Isobutyl Ketone	108101	15,000	11,000	11,000	7,400	1,700	38	3,700	9,500
n-Octadecane	593453	3,000	1,600	1,000	55	55	610	1,600	1,600
n-Triacontane	638686	1,700	900	730	55	55	170	850	850
n-Tetradecane	629594	3,800	2,100	940	55	55	1,200	2,000	2,000
n-Decane	124185	2,800	1,400	1,400	55	55	8.7	1,300	1,300
n-Docosane	629970	830	470	310	55	55	160	420	420
n-Dodecane	112403	8,800	4,400	4,300	55	55	28	4,300	4,300
n-Eicosane	112958	2,300	1,300	910	140	55	400	1,200	1,200
n-Hexacosane	630013	1,100	620	460	55	55	170	570	570
n-Hexadecane	544763	5,600	3,100	1,400	55	55	1,600	3,000	3,000
n-Tetracosane	646311	1,400	780	500	55	55	280	720	720
Octachlorodibenzo-p-dioxin	3268879	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
o-Cresol	95487	580	320	310	56	55	1.9	260	260
o+p-Xylene	136777612	8,000	4,200	4,200	450	55	25	3,700	4,100
p-Cresol	106445	550	510	510	470	57	1.4	39	460
p-Cymene	99876	450	270	260	81	55	8.9	190	220
Pentachloronitrobenzene	82688	60	30	30	< 1	< 1	< 1	30	30
Styrene	100425	25,000	15,000	13,000	4,400	150	1,600	11,000	15,000

Table 10-5 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option A Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option A Pollutant Reductions from Baseline (lbs/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Total Phenols	NA	17,000	13,000	13,000	8,800	6,900	53	4,000	6,000
TOTAL Nonconventional Organics		**660,000**	**520,000**	**500,000**	**370,000**	**120,000**	**23,000**	**150,000**	**400,000**
Other Nonconventionals									
Ammonia as Nitrogen	7664417	800,000	730,000	630,000	630,000	450,000	100,000	100,000	280,000
Chloride	16887006	4,500,000	4,500,000	4,500,000	4,500,000	3,000,000	11,000	11,000	1,500,000
Fluoride	16984488	160,000	120,000	110,000	79,000	43,000	14,000	42,000	78,000
Nitrate/Nitrite	NA	14,000	13,000	13,000	13,000	3,700	34	570	9,400
Total Phosphorus	14265442	200,000	120,000	120,000	46,000	24,000	4,900	79,000	100,000
Surfactants (MBAS)	NA	130,000	89,000	79,000	44,000	5,400	10,000	45,000	84,000
TOTAL Other Nonconventionals		**5,800,000**	**5,600,000**	**5,500,000**	**5,300,000**	**3,600,000**	**140,000**	**280,000**	**2,100,000**
Priority Metals									
Cadmium	7440439	140	98	92	54	53	5.5	44	45
Chromium	7440473	15,000	7,800	6,800	110	74	1,000	7,700	7,700
Copper	7440508	1,900	1,200	790	420	300	420	800	910
Mercury	7439976	12	6.6	6.5	1.1	1.1	< 1	5.5	5.5
Nickel	7440020	1,800	1,500	1,400	1,100	880	110	380	620
Zinc	7440666	4,500	2,500	1,500	110	110	930	2,400	2,400
TOTAL Priority Metals		**23,000**	**13,000**	**11,000**	**1,800**	**1,400**	**2,500**	**11,000**	**12,000**
Priority Organics									
1,2-Dichloroethane	107062	4,300	2,400	2,400	620	66	14	1,800	2,400
1,1,1-Trichloroethane	71556	5,500	3,000	3,000	500	55	18	2,500	3,000
1,2-Dichlorobenzene	95501	780	410	410	55	55	2.5	360	360
2-Chlorophenol	95578	480	280	250	63	55	29	220	220
2,4,6-Trichlorophenol	88062	1,500	1,100	980	780	420	160	360	730

Table 10-5 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option A Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option A Pollutant Reductions from Baseline (lbs/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Benzene	71432	280	170	170	58	55	< 1	110	110
beta-BHC	319857	3.9	1.9	1.9	< 1	< 1	< 1	1.4	1.4
Bis (2-ethylhexyl) Phthalate	117817	4,000	2,100	1,900	84	55	160	2,000	2,000
Chloroform	67663	530	350	330	170	85	24	180	270
Di-n-Octyl Phthalate	117840	1,300	690	680	55	55	4.2	630	630
Endosulfan Sulfate	1031078	2.8	2.6	2.6	2.5	2.5	< 1	< 1	< 1
Endrin Aldehyde	7421934	35	35	35	35	35	< 1	< 1	< 1
Ethylbenzene	100414	3,500	1,900	1,800	210	55	77	1,700	1,800
gamma-BHC	58899	1.8	1.8	1.8	1.8	1.0	< 1	< 1	< 1
Methylene Chloride	75092	88,000	65,000	58,000	39,000	6,300	6,800	25,000	58,000
Naphthalene	91203	2,400	1,300	1,000	110	55	270	1,200	1,200
Phenol	108952	12,000	11,000	9,800	9,200	7,300	800	1,400	3,400
Tetrachloroethylene	127184	8,800	5,200	130	55	55	5,000	5,100	5,100
Toluene	108883	14,000	8,200	8,100	2,700	55	46	5,900	8,100
Trichloroethylene	79016	160	110	110	57	55	< 1	56	58
TOTAL Priority Organics		**150,000**	**100,000**	**89,000**	**54,000**	**15,000**	**14,000**	**48,000**	**88,000**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 10-6

Rail/Chemical & Petroleum Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals									
Biochemical Oxygen Demand	NA	1,300,000	990,000	970,000	800,000	700,000	23,000	190,000	290,000
Oil and Grease (HEM)	NA	590,000	440,000	19,000	8,200	6,600	420,000	430,000	430,000
Total Suspended Solids	NA	370,000	360,000	130,000	25,000	4,600	230,000	340,000	360,000
Bulk Nonconventionals									
Chemical Oxygen Demand	NA	3,000,000	2,700,000	1,400,000	1,200,000	1,200,000	1,300,000	1,500,000	1,500,000
Total Dissolved Solids	NA	5,700,000	5,600,000	4,300,000	3,800,000	3,200,000	1,300,000	1,800,000	2,400,000
Total Organic Carbon	NA	710,000	700,000	530,000	460,000	430,000	170,000	240,000	270,000
Total Petroleum Hydrocarbons (SGT-HEM)	NA	130,000	100,000	6,800	2,500	2,500	95,000	100,000	100,000
Nonconventional Metals									
Aluminum	7429905	8,300	6,600	2,100	1,700	46	4,600	5,000	6,600
Barium	7440393	540	320	240	92	92	76	220	220
Boron	7440428	1,400	1,400	1,100	1,000	890	270	340	460
Calcium	7440702	30,000	29,000	24,000	24,000	24,000	4,900	5,100	5,100
Iron	7439896	11,000	4,000	3,600	98	46	390	3,900	4,000
Magnesium	7439954	12,000	12,000	9,900	9,800	9,800	1,800	1,900	1,900
Manganese	7439965	510	490	330	290	290	160	200	200
Phosphorus	7723140	7,600	7,200	2,800	920	580	4,400	6,300	6,600
Potassium	7440097	680,000	670,000	550,000	510,000	480,000	120,000	160,000	190,000
Silicon	7440213	9,000	7,300	7,100	6,200	6,200	140	1,100	1,100

Table 10-6 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Sodium	7440235	1,200,000	1,200,000	860,000	760,000	740,000	300,000	400,000	420,000
Sulfur	7704349	340,000	330,000	260,000	230,000	210,000	70,000	94,000	120,000
Titanium	7440326	75	67	17	2.3	2.3	50	65	65
TOTAL Nonconventional Metals		**2,300,000**	**2,200,000**	**1,700,000**	**1,500,000**	**1,500,000**	**500,000**	**680,000**	**760,000**
Nonconventional Organics									
1-Methylphenanthrene	832699	61	47	4.8	4.6	4.6	43	43	43
2,4-Diaminotoluene	95807	1,100	1,100	1,100	1,000	46	8.1	30	1,000
2,4,5-TP	93721	6.8	2.8	2.5	< 1	< 1	< 1	2.5	2.5
2,4,5-T	93765	6.8	6.7	2.6	< 1	< 1	4.1	6.1	6.3
2,4-DB (Butoxon)	94826	68	31	29	8.6	3.0	1.9	22	28
Acephate	30560191	460	450	400	380	21	53	76	430
Acetone	67641	1,100	1,000	660	660	570	360	360	460
Adsorbable Organic Halides	59473040	920	880	750	730	540	140	160	340
Benefluralin	1861401	1.4	1.3	< 1	< 1	< 1	< 1	1.1	1.3
Benzoic Acid	65850	1,800	1,700	1,200	1,200	37	500	500	1,600
Carbazole	86748	68	56	21	20	11	35	35	45
Dacthal (DCPA)	1861321	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Diallate	2303164	200	180	58	23	23	120	150	150
Dicamba	1918009	300	110	100	< 1	< 1	9.7	110	110
Dichloroprop	38120365	38	35	14	6.2	1.6	22	29	34
Dimethyl Sulfone	67710	40	33	12	11	11	21	22	22
Dinoseb	88857	17	17	6.0	< 1	< 1	11	16	16
gamma-Chlordane	5103742	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Table 10-6 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Hexanoic Acid	142621	1,700	1,200	1,200	910	910	29	280	280
m-Xylene	108383	140	110	100	73	4.6	5.5	33	100
MCPP	7085190	20,000	8,900	7,500	1,200	62	1,400	7,700	8,900
Methyl Ethyl Ketone	78933	240	240	210	210	26	23	23	210
n-Hexacosane	630013	96	74	5.7	5.1	5.1	68	69	69
n-Triacontane	638686	63	50	6.1	4.8	4.8	44	45	45
n-Docosane	629970	180	140	6.8	4.8	4.8	130	130	130
n-Hexadecane	544763	1,400	1,000	7.0	4.7	4.7	1,000	1,000	1,000
n-Octadecane	593453	880	640	10	4.6	4.6	630	630	630
n-Tetradecane	629594	1,000	730	10	4.6	4.6	720	730	730
n-Dodecane	112403	280	220	15	4.6	4.6	200	210	210
n-Tetracosane	646311	160	120	7.3	4.8	4.8	110	110	110
n-Eicosane	112958	750	550	12	4.6	4.6	540	540	540
n-Octacosane	630024	59	46	5.5	4.6	4.6	41	42	42
o+p-Xylene	136777612	95	75	72	59	4.6	2.6	16	70
Octachlorodibenzo-p-dioxin	3268879	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Octachlorodibenzofuran	39001020	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
p-Cresol	106445	30	30	30	30	4.6	< 1	< 1	26
Pentachloronitrobenzene	82688	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Propachlor	1918167	8.7	6.4	< 1	< 1	< 1	6.0	6.0	6.0
Propazine	139402	9.3	7.2	2.3	2.3	1.6	5.0	5.0	5.7
Styrene	100425	110	110	4.7	4.6	4.6	100	100	100
Terbacil	5902512	14	10	< 1	< 1	< 1	9.5	9.5	9.5

Table 10-6 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Terbuthylazine	5915413	1,400	1,200	1,100	1,000	2.3	18	150	1,200
Total Phenols	NA	430	400	250	210	42	150	190	360
TOTAL Nonconventional Organics		**35,000**	**22,000**	**15,000**	**7,900**	**2,400**	**6,600**	**14,000**	**19,000**
Other Nonconventionals									
Ammonia as Nitrogen	7664417	19,000	19,000	19,000	19,000	16,000	110	110	2,800
Chloride	16887006	880,000	870,000	680,000	610,000	610,000	180,000	260,000	260,000
Fluoride	16984488	1,700	1,400	1,400	1,100	340	44	260	1,100
Nitrate/Nitrite	NA	4,100	3,800	3,000	3,000	1,600	750	750	2,100
Total Phosphorus	142654462	7,400	6,800	2,400	900	350	4,400	5,900	6,500
Surfactants (MBAS)	NA	2,100	1,300	1,200	680	330	110	670	1,000
TOTAL Other Nonconventionals		**910,000**	**900,000**	**710,000**	**630,000**	**620,000**	**190,000**	**270,000**	**270,000**
Priority Metals									
Arsenic	7440382	34	32	21	19	13	10	13	19
Chromium	7440473	83	83	37	4.6	4.6	46	78	78
Copper	7440508	79	45	35	12	12	10	34	34
Zinc	7440666	330	310	88	9.2	9.2	220	300	300
TOTAL Priority Metals		**530**	**470**	**180**	**44**	**38**	**290**	**420**	**420**
Priority Organics									
alpha-BHC	319846	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Anthracene	120127	80	62	8.8	4.7	4.7	53	57	57
beta-BHC	319857	18	13	< 1	< 1	< 1	13	13	13
delta-BHC	319868	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dieldrin	60571	1.1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Table 10-6 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Endosulfan Sulfate	1031078	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	100414	64	47	46	35	4.6	1.7	12	43
Fluoranthene	206440	74	57	5.7	4.9	4.9	51	52	52
Naphthalene	91203	55	50	20	11	5.0	30	39	45
Phenanthrene	85018	160	120	9.0	5.3	4.9	110	120	120
Phenol	108952	310	310	230	190	4.6	76	110	300
Pyrene	129000	58	45	5.5	4.9	4.9	39	40	40
TOTAL Priority Organics		**830**	**710**	**330**	**260**	**34**	**380**	**440**	**670**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 10-7

Food Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals							
5-Day Biochemical Oxygen Demand	NA	22,000,000,000	22,000,000,000	22,000,000,000	29,000	3,000,000	22,000,000,000
Oil and Grease (HEM)	NA	2,200,000,000	68,000,000	360,000	11,000	67,000,000	68,000,000
Total Suspended Solids	NA	4,900,000,000	4,900,000,000	4,900,000,000	81,000	670,000	4,900,000,000
Bulk Nonconventionals							
Chemical Oxygen Demand	NA	110,000,000,000	110,000,000,000	110,000,000,000	95,000	15,000,000	110,000,000,000
Total Dissolved Solids	NA	78,000,000,000	78,000,000,000	78,000,000,000	740,000	11,000,000	78,000,000,000
Total Organic Carbon	NA	41,000,000,000	41,000,000,000	41,000,000,000	110,000	5,600,000	41,000,000,000
Total Petroleum Hydrocarbons (SGT-HEM)	NA	140,000,000	140,000,000	140,000,000	11,000	19,000	140,000,000
Nonconventional Organics							
Benzoic Acid	65850	5,900,000	5,900,000	5,900,000	110	52	5,900,000
Hexanoic Acid	142621	140,000,000	140,000,000	140,000,000	51	1,200	140,000,000
TOTAL Nonconventional Organics		**140,000,000**	**140,000,000**	**140,000,000**	**160**	**1,200**	**140,000,000**
Other Nonconventionals							
Ammonia as Nitrogen	7664417	7,900,000	7,800,000	7,800,000	580	1,100	7,800,000
Priority Organics							
Phenol	108952	600,000	600,000	600,000	22	5.4	600,000

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.
Note: EPA did not revise the pollutant loadings to include additional pollutants of interest and the final pollutant removal methodology because these additional pollutant removals would have an insignificant impact on the total load removals.

Table 10-8

Truck/Hopper Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals					
Total Suspended Solids	NA	17,000	15,000	8,200	6,700
Bulk Nonconventionals					
Chemical Oxygen Demand	NA	7,600	6,800	4,800	2,000
Nonconventional Metals					
Aluminum	7429905	180	160	76	88
Calcium	7440702	3,300	3,000	1,700	1,300
Iron	7439896	1,000	920	400	520
Manganese	7439965	34	30	15	16
Titanium	7440326	5.4	4.8	1.5	3.3
TOTAL Nonconventional Metals		**4,600**	**4,100**	**2,200**	**2,000**
Priority Metals					
Beryllium	7440417	< 1	< 1	< 1	< 1
Chromium	7440473	1.5	1.3	1.2	< 1
Zinc	7440666	3.0	2.7	1.5	1.2
TOTAL Priority Metals		**4.5**	**4.1**	**2.7**	**1.4**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.
Note: Load reductions include a high bias because some facilities included in the pollutant reduction analysis would be excluded because of low flow. In addition, EPA did not revise the pollutant loadings to include additional pollutants of interest and the final pollutant removal methodology because these additional pollutant removals would have an insignificant impact on the total load removals.

Table 10-9

Rail/Hopper Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals					
Total Suspended Solids	NA	890	160	160	0
Bulk Nonconventionals					
Chemical Oxygen Demand	NA	5,100	96	96	0
Nonconventional Metals					
Aluminum	7429905	17	1.5	1.5	0
Calcium	7440702	100	33	33	0
Iron	7439896	36	8.0	8.0	0
Manganese	7439965	1.5	< 1	< 1	0
Titanium	7440326	< 1	< 1	< 1	0
TOTAL Nonconventional Metals		**160**	**43**	**43**	**0**
Priority Metals					
Beryllium	7440417	< 1	< 1	< 1	0
Chromium	7440473	< 1	< 1	< 1	0
Zinc	7440666	< 1	< 1	< 1	0
TOTAL Priority Metals		**1**	**< 1**	**< 1**	**0**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.
Note: Load reductions include a high bias because some facilities included in the pollutant reduction analysis would be excluded because of low flow. In addition, EPA did not revise the pollutant loadings to include additional pollutants of interest and the final pollutant removal methodology because these additional pollutant removals would have an insignificant impact on the total load removals.

Table 10-10

Barge/Hopper Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals					
Total Suspended Solids	NA	8,500	5,500	4,500	940
Bulk Nonconventionals					
Chemical Oxygen Demand	NA	3,900	3,200	2,700	550
Nonconventional Metals					
Aluminum	7429905	94	51	42	8.7
Calcium	7440702	1,700	1,100	920	190
Iron	7439896	530	270	220	46
Manganese	7439965	17	9.7	8.1	1.7
Titanium	7440326	2.7	< 1	< 1	< 1
TOTAL Nonconventional Metals		**2,400**	**1,400**	**1,200**	**250**
Priority Metals					
Beryllium	7440417	< 1	< 1	< 1	< 1
Chromium	7440473	< 1	< 1	< 1	< 1
Zinc	7440666	1.5	< 1	< 1	< 1
TOTAL Priority Metals		**2**	**2**	**1**	**< 1**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.
Note: EPA did not revise the pollutant loadings to include additional pollutants of interest and the final pollutant removal methodology because these additional pollutant removals would have an insignificant impact on the total load removals.

Table 10-11

BPT Pollutant Loading Reductions

Subcategory	Option	BOD_5 Loading Reduction (pounds/year)	TSS Loading Reduction (pounds/year)	Oil and Grease (HEM) Loading Reduction (pounds/year)	Priority Pollutant Loading Reduction (pounds/year)	Nonconventional Pollutant Loading Reduction (pounds/year) (a)
Truck/Chemical & Petroleum	1	8.6	32	6.5	2.3	81
	2	8.6	32	6.5	2.3	81
Rail/Chemical & Petroleum	1	0	0	0	0	0
	2	0	0	22	2.2	5,000
	3	7.5	62	22	2.3	5,600
Barge/Chemical & Petroleum	1	16,000	3,300	NA	NA	NA
	2	NC	NC	NC	NC	NC
Food	1	0 (b)	0 (b)	0 (b)	0 (b)	0 (b)
	2	0 (b)	0 (b)	0 (b)	0 (b)	0 (b)
Barge/Hopper (c)	1	NR	8,600	NR	1.8	2,500

(a) The loading reductions presented exclude reduction of COD, TDS, TOC, and SGT-HEM.
(b) Pollutant reductions determined to be zero because all facilities identified by EPA currently meet the regulatory option.
(c) Load reductions include a high bias because some facilities included in the pollutant reduction analysis would be excluded because of low flow.
BOD_5 - Biochemical oxygen demand (five-day).
TSS - Total suspended solids.
HEM - Hexane extractable material.
NR - Pollutant loading reductions not calculated because pollutant is not removed by this regulatory option.
NC - Not calculated because the regulatory option was not fully evaluated by EPA following the proposed rule.
NA - Not available because EPA did not have sufficient data to fully evaluate these pollutant removals.

Table 10-12

PSES Pollutant Loading Reductions

Subcategory	Option	Priority Pollutant Loading Reduction (pounds/year)	Nonconventional Pollutant Loading Reduction (pounds/year) (a)
Truck/Chemical & Petroleum	A	16,000	420,000
	1	60,000	1,500,000
	2	99,000	6,700,000
Rail/Chemical & Petroleum	1	670	700,000
	2	870	960,000
	3	1,100	1,100,000
Barge/Chemical & Petroleum	1	0	0
	2	0	0
	3	NC	NC
Food	1	5.5	2,300
	2	600,000	150,000,000
Truck/Hopper (b)	1	1.4	2,200
Barge/Hopper (b)	1	< 1	250

(a) The loading reductions presented exclude reduction of COD, TDS, TOC, and SGT-HEM.
(b) Load reduction include a high bias because some facilities included in the pollutant reduction analysis would be excluded because of low flow.
NC - Not calculated because the regulatory option was not fully evaluated by EPA following the proposed rule.

11.0 NON-WATER QUALITY ENVIRONMENTAL IMPACTS

Sections 304(b) and 306 of the Clean Water Act require EPA to consider the non-water quality environmental impacts of effluent limitations guidelines and standards. Therefore, EPA evaluated the effects of the Transportation Equipment Cleaning Industry (TECI) final regulatory options on energy consumption, air pollution, and solid waste generation. Sections 11.1 through 11.3 discuss these impacts and Section 11.4 lists references for this section. Reference 1 summarizes the results of these analyses. In addition to these non-water quality environmental impacts, EPA considered the impacts of the final rule on noise pollution and water and chemical use and determined these impacts to be negligible.

EPA did not directly evaluate non-water quality environmental impacts of the pollution prevention alternative. However, considering pollution prevention and source reduction techniques in the alternative, EPA believes that the non-water quality environmental impacts will be less than estimated from the technology options.

11.1 Energy Impacts

Energy impacts resulting from the regulatory options include energy requirements to operate wastewater treatment equipment such as aerators, pumps, and mixers. The Agency evaluated the annual increase in electrical power consumption for each regulatory option relative to the estimated current industry consumption for wastewater treatment.

Flow reduction technologies (a component of all regulatory options for most subcategories) reduce energy requirements by reducing the number of operating hours per day and/or operating days per year for wastewater treatment equipment currently operated by the TECI. For some regulatory options, energy savings resulting from flow reduction exceed requirements for operation of additional wastewater treatment equipment, resulting in a net energy savings for these options.

Based on EPA's regulatory options (see Section 8.0), the Agency estimates a net increase in electricity use for the TECI as a result of the final rule would be approximately 5 million kilowatt hours per year. In 1990, the total U.S. industrial electrical energy purchase was approximately 756 billion kilowatt hours (2). EPA's technology options would increase U.S. industrial electrical energy purchase by 0.0007 percent. Therefore, the Agency concludes that the effluent pollutant reduction benefits from the technology options exceed the potential adverse effects from the estimated increase in energy consumption.

11.2 Air Emission Impacts

Transportation equipment cleaning (TEC) facilities generate volatile and semivolatile organic pollutants, some of which are also on the list of Hazardous Air Pollutants in Title 3 of the Clean Air Act Amendments of 1990. Air emissions from TEC facilities occur at several stages of the equipment cleaning process. Prior to cleaning, tanks which have transported volatile materials may be opened and vented with or without steam in a process called gas freeing. At some facilities, tanks are filled to capacity with water to displace vapors to the atmosphere or to a combustion device. Tanks are then cleaned, typically using either heated cleaning solutions or hot water. For recirculated cleaning solutions, pollutants may be volatilized from heated cleaning solution storage tanks. For TEC wastewater, pollutants may volatilize as the wastewater falls onto the cleaning bay floor, flows to floor drains and collection sumps, and conveys to wastewater treatment. TEC wastewater typically passes through treatment units open to the atmosphere where further pollutant volatilization may occur.

In order to quantify the impact of the regulation on air emissions at proposal, EPA performed a WATER8 (3) model analysis to determine the quantity of air emissions that would result from the treatment technology options. Reference 4 describes EPA's model analysis in detail. EPA estimated that the maximum increase in air emissions would be 153,000 kilograms per year of organic pollutants (volatile and semivolatile organics), which represented approximately 35 percent of the total organic pollutant wastewater load of raw TEC wastewater.

Since the final technology options are fairly similar to the proposed technology options, EPA estimates that these estimates would not change significantly.

EPA's estimate of air emissions reflects the increase in emissions at TEC facilities, and does not account for baseline air emissions that are currently being released to the atmosphere at the POTW or as the wastewater is conveyed to the POTW. It is expected that much of the increased emissions at indirect TEC facilities calculated for this rule are currently being released at POTWs or during conveyance to the POTW. To a large degree, this rule will merely shift the location at which the air emissions are released, rather than increasing the total air emissions from TEC wastewater. As a result, air emission from TEC wastewater at POTWs are expected to be reduced somewhat following implementation of this rule. EPA's model analysis was performed based on the most stringent regulatory options considered for each subcategory in order to create a "worst case scenario" (i.e., the more treatment technologies used, the more chance of volatilization of compounds to the air). For some subcategories, air emission impacts are overestimated (see Section 12.0).

In addition, to the extent that facilities currently operate treatment in place, the results overestimate air emission impacts from the regulatory options. Additional details concerning EPA's model analysis to estimate air emission impacts are included in "Estimated Air Emission Impacts of TEC Industry Regulatory Options" in the rulemaking record.

Based on the sources of air emissions in the TEC industry and limited data concerning air pollutant emissions from TEC operations provided in response to the 1994 Detailed Questionnaire (most facilities did not provide air pollutant emissions estimates), EPA estimates that the incremental air emissions resulting from the regulatory options are a small percentage of air emissions generated by TEC operations.

11.3 Solid Waste Impacts

Solid waste impacts resulting from the regulatory options include additional solid wastes generated by wastewater treatment technologies. These solid wastes consist of wastewater treatment residuals, including sludge, and waste oil. These impacts are discussed below in Sections 11.3.1 through 11.3.2 respectively.

EPA also analyzed options containing activated carbon adsorption and organo clay. EPA did not select any options containing these technologies, with the exception of BPT Option 2 for the Truck/Chemical & Petroleum Subcategory (see Section 12.1.1). EPA does not expect any incremental solid waste impacts from selecting this option because all known facilities in this subcategory currently operate activated carbon adsorption.

11.3.1 Wastewater Treatment Sludge

Wastewater treatment sludge is generated in two forms: dewatered sludge (or filter cake) generated by a filter press and/or wet sludge generated by treatment units such as oil/water separators, dissolved air flotation, and biological treatment. The Agency evaluated impacts of the increased sludge generation for each regulatory option relative to the estimated current industry wastewater treatment sludge generation.

Many facilities that currently operate wastewater treatment systems do not dewater wastewater treatment sludge. Storage, transportation, and disposal of relatively large volumes of undewatered sludge that would be generated after implementing the TECI regulatory options is less cost-effective than dewatering sludge on site and disposing the greatly reduced volume of resulting filter cake. However, following implementation of these regulations, EPA believes TEC facilities would install sludge dewatering equipment to handle increases in sludge generation. For these reasons, EPA estimates net decreases in the volume of wet sludge generated by the industry and net increases in the volume of dry sludge generated by the industry.

EPA estimates that the rule will result in a decrease in wet sludge generation of approximately 17 million gallons per year, which represents an estimated 98 percent decrease from current wet sludge generation. In addition, EPA estimates that the rule will result in an increase in dewatered sludge generation of approximately 35 thousand cubic yards per year, which represents an estimated 120 percent increase from current dewatered sludge generation.

Based on responses to the Detailed Questionnaire, most TEC facilities currently dispose wastewater treatment sludge in nonhazardous landfills. Sludge characterization data provided by industry and collected during EPA's TECI sampling program confirm that wastewater treatment sludge generated by the TECI is nonhazardous as determined by the Toxicity Characteristic Rule under the Resource Conservation and Recovery Act. Compliance cost estimates for the TECI regulatory options are based on disposal of wastewater treatment sludge in nonhazardous waste landfills.

The Agency concludes that the effluent benefits and the reductions in wet sludge from the technology options exceed the potential adverse effects from the estimated increase in wastewater treatment sludge generation.

11.3.2 Waste Oil

EPA estimates that compliance with this regulation will result in an increase in waste oil generation at TEC sites based on removal of oil from wastewater via oil/water separation. EPA estimates that this increase in waste oil generation will be approximately 667,000 gallons per year, which represents no more than an estimated 330 percent increase from current waste oil generation. The Agency evaluated the impacts of the increased waste oil generation for each regulatory option relative to the estimated current industry waste oil generation. The increase in waste oil generation is attributed to the removal of oil from TEC wastewaters prior to discharge to publicly owned treatment works or surface waters. This increase reflects a transfer of oil from the wastewater to a more concentrated waste oil, and does not reflect an increase in overall oil generation at TEC sites.

EPA assumes, based on responses to the Detailed Questionnaire, that waste oil will be disposed via oil reclamation or fuels blending on or off site. Therefore, the Agency does not estimate any adverse effects from increased waste oil generation.

11.4 References[1]

1. Eastern Research Group, Inc. Summary of the Results of Non-Water Quality Impacts Analyses. April 2000 (DCN T20537).

2. U.S. Department of Commerce. 1990 Annual Survey of Manufacturers, Statistics for Industry Groups and Industries. M90 (AS)-1, March 1992.

3. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Wastewater Treatment Compound Property Processor and Air Emissions Estimator (WATER8), Version 4.0. U.S. Environmental Protection Agency, Research Triangle Park, NC, May 1, 1995.

4. Eastern Research Group, Inc. WATER8 Analysis of Air Emission Impacts of TECI Regulatory Options. May 1998 (DCN T04660).

[1]For those references included in the administrative record supporting the TECI rulemaking, the document control number (DCN) is included in parentheses at the end of the reference.

12.0 OPTION SELECTION AND REGULATED POLLUTANTS

After EPA established technology options for each subcategory (see Section 8.0), EPA estimated the cost of compliance for each option (see Section 9.0); the priority, conventional, and non-conventional pollutant removals associated with each option (see Section 10.0); and the non-water quality environmental impacts associated with each option (see Section 11.0). EPA used the results of these analyses along with other factors identified in the Clean Water Act to select the technology bases from which to base the final effluent limitations guidelines and standards. This section discusses the factors considered and EPA's rationale in selecting technology options for BPT, BAT, BCT, NSPS, PSES, and PSNS. Owners or operators of facilities subject to these regulations are not required to use the specific pollution prevention and wastewater treatment technologies selected by EPA to establish effluent limitations. Rather, a facility can choose to use any combination of pollution prevention and wastewater treatment to comply with the limitations provided they are not achieved through dilution.

All supporting economic and financial analyses can be found in the Final Economic Analysis of Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Category (1). Cost-effectiveness analyses can be found in the Final Cost-Effectiveness Analysis of Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Category (2).

EPA selected pollutants to regulate from the list of pollutants of interest that are removed by each selected regulatory option (see Section 6.6). EPA also considered publicly-owned treatment works (POTW) pass through when selecting regulated pollutants for indirect dischargers. The following topics are discussed in this section:

- Section 12.1: Option Selection for Direct Dischargers;
- Section 12.2: Option Selection for Indirect Dischargers;

- Section 12.3: Rationale for Selecting Regulated Pollutants;
- Section 12.4: Regulated Pollutants for Direct Dischargers;
- Section 12.5: Regulated Pollutants for Indirect Dischargers (Including the POTW Pass-Through Analysis); and
- Section 12.6: References.

12.1 Option Selection for Direct Dischargers

EPA analyzed BPT, BCT, BAT, and NSPS options for all subcategories. EPA's option selection rationale is provided in the following subsections. Note that all costs are presented in 1998 dollars.

12.1.1 Truck/Chemical & Petroleum

EPA evaluated two options for the Truck/Chemical & Petroleum Subcategory as discussed in Section 8.2.1. EPA established BPT limits for the Truck/Chemical & Petroleum Subcategory based on Option 2. EPA's decision to base BPT limitations on Option 2 treatment primarily reflects on two factors: 1) the degree of effluent reductions attainable, and 2) the total cost of the treatment technologies in relation to the effluent reductions achieved.

Agency data indicate that a treatment train consisting of physical/chemical treatment for the removal of metals and toxics, biological treatment for the removal of decomposable organic material, and activated carbon adsorption for the removal of residual organics represents the average of the best treatment in the industry. EPA also selected Option 2 because all of the model facilities have equalization, coagulation/clarification, biological treatment, and activated carbon adsorption in place. Two of the three model facilities in the cost model have sufficient treatment in place; therefore, compliance costs for these facilities include only additional monitoring. The third facility was costed for flow reduction, sludge dewatering, and monitoring, which results in a net cost savings for the facility's entire treatment train. These net cost savings for the third facility are greater than the monitoring costs incurred by the other two facilities.

No basis could be found for identifying different BPT limitations based on age, size, process, or other engineering factors. Neither the age nor the size of the TEC facility will directly affect the treatability of the TEC wastewaters.

EPA determined that Option 2 is economically achievable because it will result in a net cost savings to the industry, and will not cause any facility closures, revenue impacts, or employment impacts. Therefore, EPA based BAT on Option 2.

EPA did not identify any technologies beyond BPT/BAT that can achieve greater removals of conventional or toxic pollutants. Therefore, EPA established BCT and NSPS equivalent to BPT and BAT.

12.1.2 Rail/Chemical & Petroleum

EPA evaluated three options for the Rail/Chemical & Petroleum Subcategory as discussed in Section 8.2.2. EPA established BPT limits for the Rail/Chemical & Petroleum Subcategory based on Option 2. EPA's decision to base BPT limitations on Option 2 treatment primarily reflects on two factors: 1) the degree of effluent reductions attainable, and 2) the total cost of the treatment technologies in relation to the effluent reductions achieved.

EPA evaluated the costs, loads, and impacts of the one model direct discharging facility which currently operates oil/water separation, equalization, pH adjustment, biological treatment, and a filter press. EPA estimates that the cost of implementing Option 1 is for monitoring costs only (i.e., zero capital costs), totaling approximately $4,900 annually post-tax ($7,600 pre-tax). Option 2 costs $40,800 annualized post-tax ($59,000 pre-tax), and Option 3 costs $60,600 annualized post-tax ($89,000 pre-tax).

EPA did not have sampling data for direct dischargers in this subcategory. EPA has therefore relied on treatment data transferred from the Barge/Chemical & Petroleum Subcategory to establish limits for conventionals (see Section 12.4.2), and treatment data from indirect dischargers in the Rail/Chemical & Petroleum Subcategory to establish limits for toxic pollutants (see Section 12.4.2). Furthermore, all toxic parameters considered for regulation were treated to the same level at Options 1, 2, and 3. Although EPA believes that the treatment in place at the one rail direct discharging facility identified by EPA is sufficient to meet the final limitations (see Section 2.0), EPA has decided to establish BPT based on Option 2, which includes dissolved air flotation (DAF). EPA believes that this is the most appropriate technology because the data set used to transfer limits (from both the rail indirect discharging facilities and the barge direct discharging facilities) includes DAF treatment.

No basis could be found for identifying different BPT limitations based on age, size, process, or other engineering factors. Neither the age nor the size of the TEC facility will directly affect the treatability of the TEC wastewaters.

EPA determined that Option 2 is economically achievable because it will not cause the facility to close or any revenue or employment impacts. Therefore, EPA based BAT on Option 2.

EPA evaluated Option 3 as a BCT candidate technology to determine whether it was cost-reasonable according to the BCT Cost Test. The option did not pass the BCT Cost Test; therefore, EPA established BCT equivalent to BPT.

Due to the incremental economic impacts projected at Option 3 (see reference 1 for additional information), EPA believes that Option 3 may create a barrier to entry for new sources. In addition, few additional pollutant removals are achieved by Option 3. Therefore, EPA decided to establish NSPS equivalent to BPT, BAT, and BCT.

12.1.3 Barge/Chemical & Petroleum

EPA evaluated two options for the Barge/Chemical & Petroleum Subcategory as discussed in Section 8.2.3. EPA established BPT limits for the Barge/Chemical & Petroleum Subcategory based on Option 1. EPA's decision to base BPT limitations on Option 1 treatment primarily reflects on two factors: 1) the degree of effluent reductions attainable, and 2) the total cost of the treatment technologies in relation to the effluent reductions achieved.

EPA estimates that the annualized costs for Option 1 are $89,500 ($146,300 pre-tax) and Option 2 are $345,700 ($540,900 pre-tax). EPA estimates that both Option 1 and Option 2 remove 19,300 pounds of BOD and TSS. Based on the treatment technologies in place at the model facilities, coupled with the biological treatment system upgrades estimated by EPA to achieve Option 1 performance levels (see Section 9.2.9), EPA predicts that Option 2 would not result in any additional removal of toxic pounds because most pollutants are already treated to very low levels, often approaching or below non-detect levels.

Additionally, the Agency concluded that reverse osmosis is not commonly used in the industry. Therefore, Option 2 does not represent the average of the best treatment.

No basis could be found for identifying BPT limitations based on age, size, process, or other engineering factors. Neither the age nor the size of the TEC facility will directly affect the treatability of TEC wastewaters.

EPA also analyzed the costs of all options to determine the economic impact that this regulation would have on the TECI. EPA's assessment showed that implementation of Option 1 is projected to result in no facility closures and no employment losses (see reference 1 for additional information). Therefore, EPA based BAT on Option 1.

EPA evaluated Option 2 as a BCT candidate technology to determine whether it was cost-reasonable according to the BCT Cost Test. The option did not pass the BCT Cost Test; therefore, EPA established BCT equivalent to BPT.

EPA also established NSPS equivalent to BPT, BAT, and BCT because few additional pollutant removals are achieved by Option 2.

12.1.4 Food

EPA evaluated two options for the Food Subcategory as discussed in Section 8.2.4. EPA established BPT limitations for the Food Subcategory based on Option 2. EPA's decision to base BPT limitations on Option 2 treatment primarily reflects on two factors: 1) the degree of effluent reductions attainable, and 2) the total cost of the treatment technologies in relation to the effluent reductions achieved.

The wastewater generated by the Food Subcategory contains high loadings of biodegradable organics and few toxic pollutants. Based on the data collected by EPA, raw wastewater contained significant levels of organic material, exhibiting an average BOD_5 concentration of 3,500 mg/L. Therefore, EPA concluded that some form of biological treatment is necessary to reduce potential impacts to receiving waters from direct discharging facilities. All existing facilities that responded to the Screener Questionnaire indicated that they have a biological treatment system in place. Accordingly, EPA considers Option 2 to represent the average of the best treatment and based BPT on Option 2.

EPA projects no additional pollutant removals and no additional costs to the industry based on EPA's selection of Option 2 because all facilities identified by EPA currently have the selected technology in place.

EPA did not establish BAT for the Food Subcategory because EPA found that food grade facilities discharge very few pounds of toxic pollutants not amenable to treatment by a biological treatment system.

EPA did not identify any technologies beyond BPT that can achieve greater removals of conventional pollutants. Therefore, EPA established BCT equivalent to BPT.

Finally, for the same reasons EPA established BCT equivalent to BPT, and did not establish BAT for this subcategory, EPA established NSPS equivalent to BPT.

12.1.5 Truck/Hopper and Rail/Hopper

EPA was not able to identify any direct discharging facilities in the Truck/Hopper and Rail/Hopper subcategories; therefore, EPA has not established effluent limitations for direct dischargers for these subcategories. Permit writers can more appropriately control discharges from these facilities, if any, using best professional judgement.

12.1.6 Barge/Hopper

EPA evaluated one option for the Barge/Hopper Subcategory as discussed in Section 8.2.5. EPA did not establish BPT, BCT, BAT, or NSPS regulations for this subcategory because hopper facilities discharge very few pounds of conventional or toxic pollutants. EPA sampling data showed that very little wastewater is generated from cleaning the interiors of hopper tanks due to the dry nature of bulk materials transported. Therefore, EPA determined that nationally applicable regulations are unnecessary for this subcategory. Direct dischargers will remain subject to limitations established by permit writers on a case-by-case basis using best professional judgement.

12.2 Indirect Discharging Options

EPA analyzed PSES and PSNS options for all subcategories. EPA's option selection rationale is provided in the following subsections. Note that all costs are presented in 1998 dollars.

12.2.1 Truck/Chemical & Petroleum

EPA evaluated three options for the Truck/Chemical & Petroleum Subcategory as discussed in Section 8.6.1. EPA also considered a pollution prevention approach as a compliance option as discussed in Section 8.6.6. EPA established PSES for the Truck/Chemical & Petroleum Subcategory based on a pollution prevention compliance option as well as a traditional compliance option (i.e., a set of numeric pretreatment standards) based on Option 1. EPA believes that pollution prevention and effective pollutant management is an appropriate and effective way of reducing pollutant discharges from this subcategory. Further, the Agency believes that providing a pollution prevention compliance option may be less costly than the technology options considered for regulation. Therefore, EPA provided both a pollution prevention option based on development and implementation of a Pollutant Management Plan (PMP) and a set of numeric limits allowing facility owners and operators to choose the less expensive compliance alternative. For the portion of the industry that already has extensive treatment in place, it may be more cost effective to comply with the numeric limits. Conversely, for those facilities already utilizing good pollution prevention practices and/or operating in accordance with a PMP, it may be more cost effective to use the pollution prevention compliance alternative.

For establishing numeric pretreatment standards, EPA's decision to base PSES limitations on Option 1 treatment primarily reflects on three factors: 1) the degree of effluent reductions attainable, 2) the total cost of the treatment technologies in relation to the effluent reductions achieved, and 3) economic impacts.

Option A would have a post-tax annualized cost of $5.2 million ($8.1 million pre-tax) for 286 facilities. Option 1 would cost $9.2 million ($14.4 million pre-tax) and Option 2 would cost $20.9 million ($32.9 million pre-tax) annualized. Option A is projected to remove 1,500 toxic pound-equivalents, while Option 1 removes 11,700 and Option 2 removes 20,900 toxic pound-equivalents. EPA predicts that, if selected, Option 2 would not result in any significant additional benefits incremental to Option 1 because the additional toxic pound-equivalents removed by Option 2 are mainly due to pollutants that would not be selected for regulation (see Section 12.5).

These toxic pound-equivalents estimates do not include any credit for reductions of a number of pesticides, herbicides, or other toxic agents that may be present in TEC wastewater at some facilities but that were not found at the time of EPA's sampling. According to the detailed questionnaire responses, EPA found that over 3,000 types of cargos are cleaned at tank truck facilities. However, absent better estimates, EPA based its analysis on those toxic substances that were confirmed present by its sampling protocols.

EPA projects that there will be no adverse economic impacts for any option when a positive cost pass through assumption is made. However, EPA has also looked at the assumption of no cost pass through, which indicated that 14 facilities may experience financial stress at Option 1, and that 22 facilities may experience financial stress at Option 2. At Option 1, none of the 14 facilities experiencing financial stress are small businesses; at Option 2, 7 of the 22 facilities are small businesses (see reference 1 for additional information).

EPA does not believe that the lower cost of Option A demonstrated significant removals of toxics to justify its selection as a regulatory option. Option A was considerably less cost effective than Option 1 (see reference 2 for additional information). Additionally, EPA agrees with a pretreatment authority that accepts TEC wastewater who has argued that oil/water separation alone is not effective for achieving concentration standards for the pollutants that may be discharged by tank cleaning operations. The pretreatment authority also indicated its support for effective pollution prevention practices as an alternative to numeric limits for these facilities.

EPA believes that a dual approach, which offers facilities a choice between pollution prevention and compliance with numeric limits based on Option 1, is economically achievable and will significantly reduce pollutant loadings. EPA has also made a finding of no barrier to entry associated with Option 1 level of control for new sources; therefore, EPA established PSES and PSNS based on a dual approach involving a pollution prevention compliance option and traditional limits based on Option 1 technologies.

12.2.2 Rail/Chemical & Petroleum

EPA evaluated three options for the Rail/Chemical & Petroleum Subcategory as discussed in Section 8.6.2. EPA also considered a pollution prevention approach as a compliance option as discussed in Section 8.6.6. EPA established PSES for the Rail/Chemical & Petroleum Subcategory based a pollution prevention compliance option as well as a traditional compliance option based on Option 2. EPA has determined that a Pollutant Management Plan is an appropriate compliance alternative to the numerical pretreatment standards for the Rail/Chemical and Petroleum Subcategory. EPA believes this Pollutant Management Plan alternative is consistent with the CWA and the Pollution Prevention Act of 1990; it is comparable to the numerical standards in terms of pollutant removal and costs incurred by facilities; is economically achievable; and will allow an appropriate level of flexibility to facility owners and operators on how to best achieve a reduction in pollutants being discharged to the POTW. For establishing numeric pretreatment standards, EPA's decision to base PSES limitations on Option 2 treatment primarily reflects on three factors: 1) the degree of effluent reductions attainable, 2) the total cost of the treatment technologies in relation to the effluent reductions achieved, and 3) economic impacts.

EPA estimates that Option 1 would have an annualized cost of $0.60 million ($0.90 million pre-tax), Option 2 would cost $1.0 million ($1.5 million pre-tax), and Option 3 would cost $1.6 million ($2.5 million pre-tax). EPA also considered the cost effectiveness to evaluate the relative efficiency of each option in removing toxic pollutants. Option 1 is projected to remove 6,600 toxic-pound equivalents, Option 2 removes 7,300 toxic-pound equivalents, and

Option 3 removes 7,800 toxic-pound equivalents. EPA predicts that, if selected, Option 3 would not result in significant additional benefits incremental to Option 2 because the additional toxic pound-equivalents removed by Option 3 are due to pollutants that would not be selected for regulation (see Section 12.5).

EPA considered selecting Option 1; however, EPA shares the concerns of a pretreatment authority that accepts TEC wastewater that oil/water separation alone is not sufficient pretreatment for the pollutants in Rail/Chemical & Petroleum Subcategory wastewaters. Additionally, EPA is concerned about any discrepancy in selected options for the rail and truck facilities because treatment options should be similar for facilities that potentially compete with each other.

Option 2, which is analogous to PSES Option 1 in the Truck/Chemical & Petroleum Subcategory, achieves a significant reduction in toxic loadings and results in no closures, financial stress, or revenue impacts.

EPA established PSNS equivalent to PSES because EPA does not predict significant additional pollutant removals by Option 3, and EPA does not believe that the higher costs for Option 3 justify its selection for pretreatment standards for new sources.

12.2.3 Barge/Chemical & Petroleum

EPA evaluated three options for the Barge/Chemical & Petroleum Subcategory as discussed in Section 8.6.3. EPA did not propose PSES for this subcategory, but is promulgating PSES for the Barge/Chemical & Petroleum Subcategory based on Option 2 for the reasons discussed below.

EPA proposed Option 2 for PSNS. EPA did not propose PSES for the Barge/Chemical & Petroleum Subcategory because EPA identified only one facility discharging to a POTW. However, since the proposal, EPA has identified four facilities that previously discharged directly to surface waters and have since either switched or plan to switch discharge status. EPA now estimates that there are five facilities that discharge wastewater to a POTW.

EPA evaluated the treatment in place and levels of control currently achieved by the model indirect discharging Barge/Chemical & Petroleum facilities. EPA was able to evaluate effluent discharge concentrations of BOD and oil & grease from all of these model facilities and TSS from two model facilities (EPA did not have the data to evaluate the discharge concentrations of other parameters). Based on the discharge concentrations of these conventional pollutants, EPA believes that all model indirect discharging facilities are meeting the levels of control that would be established under PSES at Option 2. Although EPA does not establish technology-based pretreatment standards for conventional pollutants, EPA believes that these parameters demonstrate a level of control similar to the technology options for PSES at Option 2, and that the effluent concentrations of other pollutants of interest also would be controlled similarly.

Therefore, EPA estimates that the cost of implementing PSES standards equivalent to Option 2 would be solely for increased monitoring costs, totaling approximately $67,000 annually. EPA believes that all indirect discharging facilities have sufficient treatment in place to prevent pass through or interference and are predicted to meet standards that would be established under PSES. EPA predicts that there would be no incremental removals or benefits associated with establishing PSES standards.

In addition, EPA evaluated the pass through of pollutants regulated under BAT. As was discussed at proposal for establishment of PSNS, and in the Notice of Availability for SGT-HEM, EPA found that a number of pollutants would in fact pass through a POTW based on BAT treatment. Due to the pass through of a number of pollutants, and due to the number of facilities that have switched discharge status since proposal, EPA concluded that it should establish PSES based on Option 2. EPA believes that PSES is necessary in order to establish similar levels of control for direct and indirect dischargers, and especially to establish similar levels of control for those facilities that may decide to switch discharge status.

As noted under NSPS for the Barge/Chemical & Petroleum Subcategory, EPA believes that Option 3, which includes reverse osmosis treatment, would not result in a significant reduction of toxic pollutants because most pollutants are already treated to very low levels based on Option 2 level of control. Option 2 was demonstrated to treat many regulated pollutants to effluent levels approaching the detection limit. EPA has therefore decided to establish PSNS based on Option 2.

12.2.4 Food

EPA evaluated two options for PSES for the Food Subcategory as discussed in Section 8.6.4. This evaluation also considered the types and concentrations of pollutants found in raw wastewaters in this subcategory. As expected, food grade facilities do not discharge significant quantities of toxic pollutants to POTWs. In addition, conventional pollutants present in the wastewater were found at concentrations that are amenable to treatment at a POTW. As a result, EPA did not establish PSES or PSNS for the Food Subcategory due to the low levels of toxic pollutants discharged by facilities in this subcategory.

12.2.5 Truck/Hopper, Rail/Hopper, and Barge/Hopper

EPA evaluated one option for PSES for the Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories as discussed in Section 8.6.5. This evaluation also considered the types and concentrations of pollutants found in raw wastewaters for these subcategories. EPA estimates that 42 indirect discharging hopper facilities discharge a total of 3.5 toxic-pound equivalents to the nation’s waterways, or less than one toxic-pound equivalent per facility. Additionally, EPA estimates that the total cost to the industry to implement PSES would be greater than $350,000 annually. EPA did not consider the estimated costs to control the discharge of these small amounts of pound equivalents to be reasonable.

EPA also evaluated the levels of pollutants in raw wastewaters and determined that none were present at levels expected to cause inhibition of the receiving POTW.

Based on these factors, EPA did not establish PSES or PSNS for the Truck/Hopper, Rail/Hopper, or Barge/Hopper Subcategories.

12.3 Rationale for Selecting Regulated Pollutants

EPA selected a subset of pollutants for which to establish numerical effluent limitations from the list of pollutants of interest for each regulated subcategory (see Section 6.6 for details on the pollutants of interest). Due to the wide range of cargos transported in tanks cleaned by TEC facilities it would be very difficult to establish numerical limitations for all of the pollutants that may be found in TECI wastewaters. Additionally, monitoring for all pollutants of interest is not necessary to ensure that TECI wastewater pollution is adequately controlled, since many of the pollutants originate from similar sources, have similar treatabilities, and are expected to be removed by the same mechanisms and treated to similar levels.

Therefore, rather than set effluent limitations for all pollutants detected in EPA's wastewater characterization and wastewater treatment effectiveness sampling episodes, EPA attempted to select a group of pollutants that were frequently detected in TECI wastewater and whose control through a combination of physical and chemical treatment processes would lead to the control of a wide range of pollutants with similar properties. Compounds selected for regulation were chosen to be representative of the various groups of compounds found to be effectively treated in each of the regulated subcategories. Specific compounds selected vary for each of the subcategories, but include compounds from various groups including metals, conventionals, and organics. Organic compounds were selected to be representative of the various groups of organic compounds detected (hydrocarbons, organohalogens, carboxylic acid derivatives, phthalic acid esters, etc.). In addition, special consideration was given to priority pollutants that were detected at treatable levels and were demonstrated to be effectively removed were selected for regulation.

Pollutants were selected for regulation based on the following criteria:

- EPA selected pollutants that were detected most frequently in TECI wastewater. Generally, this meant that a pollutant had to be detected at least four times in wastewater characterization samples for the Truck/Chemical & Petroleum and Barge/Chemical & Petroleum Subcategories, and at least three times in the Rail/Chemical & Petroleum Subcategory. Priority pollutants that were effectively removed and were present at significant concentrations in wastewaters, but were not detected at the frequencies described above, were also considered for regulation.

- EPA selected pollutants that were detected at significant concentrations in raw wastewater at those facilities sampled for treatment performance. Generally, the average pollutant concentration in raw wastewater had to be at least 10 times the method detection limit (MDL) to be considered for regulation. Priority pollutants that were effectively removed and that were detected frequently in the industry, but whose average concentration was less than 10 times the MDL, were also considered for regulation.

- EPA did not select pesticides or herbicides for regulation.

- EPA did not select dioxins or furans for regulation.

- EPA did not select chemicals that are used in wastewater treatment operations of the selected treatment technology option.

- EPA did not select pollutant parameters that were not considered toxic.

- EPA selected pollutants that were removed by the selected treatment technology option by at least 50 percent.

EPA did not select pesticides, herbicides, dioxins, or furans for regulation in any subcategory for three reasons. First, these pollutants were generally found at very low levels in raw wastewater. Second, the treatment technologies sampled by EPA were found to remove these pollutants from the wastewater. The treatment technologies in each subcategory treated most pesticides, herbicides, dioxins, and furans to low levels in the effluent. Third, compliance monitoring costs for these pollutants are prohibitively expensive for the TECI. Therefore, EPA has determined that it is unnecessary to set nationally-applicable discharge standards for specific pesticides, herbicides, dioxins, and furans.

EPA also did not establish limits for phenol in any subcategory. Based on the small number of direct dischargers present in the industry, EPA feels that local permitting authorities can decide whether establishing discharge limitations based on water quality considerations is appropriate. For indirect dischargers, phenol is readily biodegradable and is not expected to pass through a POTW.

EPA determined that COD from TEC wastewater is adequately treated in a POTW and does not pass through. Therefore, EPA did not select COD for regulation for indirect dischargers. EPA also believes that COD regulation is unnecessary for direct dischargers due to the control of other conventionals, including BOD, TSS, and oil and grease.

For direct discharging facilities, EPA is regulating the conventional pollutant oil and grease (HEM) but is not regulating the nonconventional pollutant non-polar material (SGT-HEM). The analysis for HEM quantifies both petroleum-based oils and greases as well as edible oils from vegetables or fish. SGT-HEM, however, quantifies only the petroleum-based fraction. EPA believes it is unnecessary to select both HEM and SGT-HEM for regulation because the petroleum component present in the wastewater is a subset of the total oil and grease measurement. EPA therefore concluded that establishing effluent limitations for both oil and grease and SGT-HEM would be redundant for direct discharging facilities.

Based on the methodology described above, EPA feels that it has selected pollutants for regulation in each subcategory that will provide adequate control of the wide range of pollutants that may be found in TECI wastewaters.

12.4 <u>Regulated Pollutants for Direct Dischargers</u>

EPA selected regulated pollutants for the Truck/Chemical & Petroleum Subcategory, Rail/Chemical & Petroleum Subcategory, Barge/Chemical & Petroleum Subcategory, and Food Subcategory. The specific regulated pollutants for each subcategory are discussed in the following subsections.

12.4.1 Truck/Chemical & Petroleum

EPA established BPT, BCT, BAT, and NSPS limitations for the Truck/Chemical & Petroleum Subcategory. The following pollutants and pollutant parameters were not selected for regulation because they are not present at treatable concentrations or are not likely to cause toxic effects: adsorbable organic halides (AOX), fluoride, nitrate/nitrite, total phosphorus, total phenols, surfacants (MBAS), total organic carbon (TOC), total dissolved solids (TDS), alpha-terpineol, benzene, benzoic acid, benzyl alcohol, chloroform, 1,2-dichlorobenzene, dimethyl sulfone, n-decane, n-triacontane, o-cresol, p-cresol, p-cymene, trichloroethene, 2-methylnaphthalene, 2-chlorophenol, 2-isopropylnaphthalene, boron, phosphorus, silicon, tin, and titanium.

The following pollutants were not selected for regulation because they are commonly used in the industry as wastewater treatment chemicals: aluminum, iron, and manganese.

The following pollutants were not selected for regulation because they are likely to be volatilized in the treatment system and are therefore not considered to be treated by the selected technology: acetone, 1,2-dichloroethane, ethylbenzene, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, tetrachloroethene, toluene, 1,1,1-trichloroethane, m-xylene, o-+p-xylene, and naphthalene.

The following pollutant was determined to be present in TEC wastewater due to source water contamination, and was therefore not selected as a pollutant to regulate: zinc.

The following pollutant was not selected for regulation because EPA believes that its sampling data is not representative of the practices that may be performed by tank truck facilities and because EPA has insufficient data to evaluate the effectiveness of industry-supplied sampling data: chromium.

The following pollutants were not selected for regulation because they are controlled through the regulation of other pollutants: bis(2-ethylhexyl)phthalate, di-n-octyl phthalate, n-docosane, n-dodecane, n-eicosane, n-hexacosane, n-hexadecane, n-octadecane, n-tetracosane, n-tetradecane, and styrene.

The following pollutants were not selected for regulation because the treatment system did not demonstrate removals of at least 50%: 2,4,6-trichlorophenol, cadmium, calcium, magnesium, molybdenum, nickel, potassium, sodium, strontium, sulfur, ammonia as nitrogen, and chloride.

EPA is regulating BOD_5, TSS, oil and grease (HEM), pH, copper, and mercury.

12.4.2 Rail/Chemical & Petroleum

EPA established BPT, BCT, BAT, and NSPS limitations for the Rail/Chemical & Petroleum Subcategory. The following pollutants and pollutant parameters were not selected for regulation because they are not present at treatable concentrations or are not likely to cause toxic effects: adsorbable organic halides (AOX), ammonia as nitrogen, nitrate/nitrite, surfacants (MBAS), total dissolved solids (TDS), total organic carbon (TOC), total phenols, total phosphorus, acetone, anthracene, barium, benzoic acid, carbazole, chromium, copper, dimethyl sulfone, ethylbenzene, fluoride, o-+p-xylene, 1-methylphenanthrene, naphthalene, n-octacosane, p-cresol, phosphorus, pyrene, styrene, titanium, n-triacontane, zinc, and 2,4-diaminotoluene.

The following pollutants were not selected for regulation because they are commonly used in the industry as wastewater treatment chemicals: aluminum and iron.

The following pollutant was not selected for regulation because it is likely to be volatilized in the treatment system and is therefore not considered to be treated by the selected technology: m-xylene.

The following pollutants were not selected for regulation because they are controlled through the regulation of other pollutants: n-docosane, n-dodecane, n-eicosane, n-hexacosane, n-hexadecane, n-octadecane, n-tetracosane, and n-tetradecane.

The following pollutants were not selected for regulation because the treatment systems did not demonstrate removals of at least 50%: arsenic, boron, calcium, chloride, hexanoic acid, magnesium, manganese, potassium, silicon, sodium, and sulfur.

EPA is regulating BOD_5, TSS, oil and grease (HEM), pH, fluoranthene, and phenanthrene.

12.4.3 Barge/Chemical & Petroleum

EPA established BPT, BCT, BAT, and NSPS limitations for the Barge/Chemical & Petroleum Subcategory. The following pollutants and pollutant parameters were not selected for regulation because they were present only in trace amounts, are not present at treatable concentrations, or are not likely to cause toxic effects: adsorbable organic halides (AOX), ammonia as nitrogen, nitrate/nitrite, surfacants (MBAS), total dissolved solids, total organic carbon (TOC), total phenols, total phosphorus, acenaphthylene, acrylonitrile, anthracene, benzoic acid, calcium, chloride, chloroform, fluoride, hexavalent chromium, methylene chloride, molybdenum, 2,3-benzofluorene, n-octacosane, osmium, ruthenium, phosphorus, potassium, silicon, sodium, strontium, sulfur, and titanium.

The following pollutants were not selected for regulation because they are commonly used in the industry as wastewater treatment chemicals: aluminum, iron, magnesium, and manganese.

The following pollutants were not selected for regulation because they are likely to be volatilized in the treatment system and are therefore not considered to be treated by the selected technology: acetone, benzene, ethylbenzene, methyl ethyl ketone, methyl isobutyl ketone, toluene, m-xylene, o-+p-xylene, acenaphthene, biphenyl, fluorene, naphthalene, phenanthrene, and styrene.

The following pollutants were not selected for regulation because they are controlled through the regulation of other pollutants: bis(2-ethylhexyl)phthalate, 3,6-dimethylphenanthrene, n-hexacosane, n-hexadecane, 1-methylfluorene, 2-methylnaphthalene, 1-methylphenanthrene, pentamethylbenzene, di-n-octyl phthalate, n-decane, n-docosane, n-dodecane, n-eicosane, n-octadecane, n-tetracosane, n-tetradecane, p-cymene, and pyrene.

The following pollutant was not selected for regulation because the treatment system did not demonstrate removals of at least 50%: boron.

EPA is regulating BOD_5, TSS, oil and grease (HEM), pH, cadmium, chromium, copper, lead, mercury, nickel, and zinc.

12.4.4 Food

EPA established BPT, BCT, and NSPS limitations for the Food Subcategory for BOD_5, TSS, oil and grease (HEM), and pH.

12.5 <u>Regulated Pollutants for Indirect Dischargers</u>

Section 307(b) of the CWA requires the Agency to promulgate pretreatment standards for existing sources (PSES) and new sources (PSNS). To establish pretreatment standards, EPA must first determine whether each BAT pollutant under consideration passes through a POTW, or interferes with the POTW's operation or sludge disposal practices.

The Agency evaluated POTW pass through for the TEC pollutants of interest for all subcategories where EPA is regulating priority and nonconventional pollutants. In determining whether a pollutant is expected to pass through a POTW, the Agency compared the nation-wide average percentage of a pollutant removed by well-operated POTWs with secondary treatment to the percentage of a pollutant removed by BAT treatment systems. A pollutant is determined to "pass through" a POTW when the average percentage removal achieved by a well-operated POTW (i.e., those meeting secondary treatment standards) is less than the percentage removed by the industry's direct dischargers that are using the selected BAT technology.

The approach to the definition of pass-through satisfies two competing objectives set by Congress: 1) the wastewater treatment performance for indirect dischargers be equivalent to that for direct dischargers, and 2) that the treatment capability and performance of the POTW be recognized and taken into account in regulating the discharge of pollutants from indirect dischargers. Rather than compare the mass or concentration of pollutants discharged by the POTW with the mass or concentration of pollutants discharged by a BAT facility, EPA compares the percentage of the pollutants removed by the BAT treatment system with the POTW removal. EPA takes this approach because a comparison of mass or concentration of pollutants in a POTW effluent to pollutants in a BAT facility's effluent would not take into account the mass of pollutants discharged to the POTW from non-industrial sources, nor the dilution of the pollutants in the POTW effluent to lower concentrations from the addition of large amounts of non-industrial wastewater.

To establish the performance of well-operated POTWs, EPA primarily compiled POTW percent-removal data from previous effluent guidelines rulemaking efforts, which have established national POTW percent-removal averages for a broad list of pollutants. These guidelines have used the information provided in "The Fate of Priority Pollutants in Publicly Owned Treatment Works," commonly referred to as the 50 POTW Study. For those pollutants not found in the 50 POTW Study, EPA used data from EPA's National Risk Management Research Laboratory's (RREL) treatability database. These studies were discussed previously in Section 3.0.

To perform the TEC pass-through analysis, EPA used percent removal rates generated for the rulemaking efforts from the Metal Products and Machinery (MP&M) Industry

(3), the Centralized Waste Treatment (CWT) Industry (4), the Industrial Laundries Industry (5), and the Pesticide Manufacturing Industry (6). EPA used POTW removal data from the 50 POTW study, the RREL database, and the rulemaking efforts listed above to compile the POTW removals used for the TECI (7).

For indirect dischargers, EPA did not conduct the pass through analysis on the conventional pollutant oil and grease because of a POTW's ability to treat the non-petroleum based oils and greases, such as animal fats and vegetable oils. EPA instead conducted the pass-through analysis only on SGT-HEM. SGT-HEM quantifies the petroleum-based fraction of oil and grease which may not be treated as effectively in a POTW as with the BAT treatment technology. In order to determine removal rates for SGT-HEM, EPA used data submitted by the County Sanitation Districts of Los Angeles County resulting in a percent removal estimate of 74 percent (8). EPA established pretreatment standards for SGT-HEM in cases where EPA demonstrated that the selected BAT treatment technology will achieve greater removals of SGT-HEM than a POTW. In these cases, EPA believes that SGT-HEM has been demonstrated to pass through and that it is a good indicator parameter for a number of nonconventional pollutants.

Based on the criteria described above, EPA selected pollutants for regulation for indirect dischargers for each of the regulated subcategories. Note that the Agency has chosen not to regulate indirect dischargers in the Food, Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories.

The following sections give the results of the pass-through analysis for each subcategory. The pass-through analysis was not conducted for the conventional pollutants (BOD_5, TSS, pH, and oil and grease) that are regulated for direct dischargers because conventional pollutants are not regulated under PSES and PSNS. Pollutants in each subcategory and technology option that were demonstrated to pass through a POTW were selected for regulation. The results of the pass-through analysis for the Truck/Chemical & Petroleum, Rail/Chemical & Petroleum, and Barge/Chemical & Petroleum Subcategories are listed in Tables 12-1, 12-2, and 12-3.

12.5.1 Truck/Chemical & Petroleum

EPA established PSES and PSNS limitations for the Truck/Chemical & Petroleum Subcategory. Based on the pass-through analysis, EPA determined that the following pollutants passed through a POTW and were therefore selected for regulation: copper, mercury, and SGT-HEM.

12.5.2 Rail/Chemical & Petroleum

EPA established PSES and PSNS limitations for the Rail/Chemical & Petroleum Subcategory. Based on the pass-through analysis, EPA determined that the following pollutants passed through a POTW and were therefore selected for regulation: SGT-HEM, phenanthrene, and fluoranthene.

12.5.3 Barge/Chemical & Petroleum

EPA established PSES and PSNS limitations for the Barge/Chemical & Petroleum Subcategory. Based on the pass-through analysis, EPA determined that the following pollutants passed through a POTW and were therefore selected for regulation: SGT-HEM, cadmium, chromium, copper, lead, mercury, nickel, and zinc.

12.6 References

1. U.S. Environmental Protection Agency. Final Economic Analysis of Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Category. EPA 821-R-00-013, June 2000.

2. U.S. Environmental Protection Agency. Final Cost-Effectiveness Analysis of Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Category. EPA 821-R-00-014, June 2000.

3. U.S. Environmental Protection Agency. Development Document for Proposed Effluent Limitations Guidelines and Standards for the Metals Products and Machinery Phase I Point Source Category. EPA 821-R-95-021, April 1995.

4. U.S. Environmental Protection Agency. Development Document for Proposed Effluent Limitations Guidelines and Standards for the Centralized Waste Treatment Industry. EPA 821-R-95-006, January 1995.

5. U.S. Environmental Protection Agency. Development Document for Proposed Pretreatment Standards for Existing and New Sources for Industrial Laundries Point Source Category. EPA 821-R-97-007, November, 1997.

6. U.S. Environmental Protection Agency. Development Document for Effluent Limitations Guidelines and New Source Performance Standards for Pesticide Chemical Manufacturers. EPA 821-R-93-016, September 1993.

7. U.S. Environmental Protection Agency. Final POTW Pass-Through Analysis for the TECI. April 2000 (DCN T20534).

8. 64 FR 38870 (DCN 20477).

Table 12-1

Pass-Through Analysis for the Truck/Chemical & Petroleum Subcategory

Pollutant	Average BAT Percent Removal	Average POTW Percent Removal	Pass Through
Copper	87	84	Yes
Mercury	94	90	Yes

Table 12-2

Pass-Through Analysis for the Rail/Chemical & Petroleum Subcategory

Pollutant	Average BAT Percent Removal	Average POTW Percent Removal	Pass Through
Fluoranthene	92	42	Yes
Phenanthrene	97	95	Yes

Table 12-3

Pass-Through Analysis for the Barge/Chemical & Petroleum Subcategory

Pollutant	Average BAT Percent Removal	Average POTW Percent Removal	Pass Through
Cadmium	97	90	Yes
Chromium	98	80	Yes
Copper	98	84	Yes
Lead	95	77	Yes
Mercury	98	90	Yes
Nickel	96	51	Yes
Zinc	93	80	Yes

13.0 IMPLEMENTATION OF EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

A permit writer must first determine if a facility is subject to the Transportation Equipment Cleaning (TEC) regulation by evaluating its tank cleaning operations, including the tank types cleaned, cargo types cleaned, and annual wastewater discharge volume. This section is intended to provide guidance to permit writers and TEC facilities on how the TEC rule will be applied and implemented.

Indirect discharging facilities in the Truck/Chemical and Petroleum and Rail/Chemical and Petroleum subcategories subject to the TECI regulation will need to make an initial choice on how to comply with the regulation. They will need to choose to either comply with numerical effluent limitations guidelines and standards or agree to develop and comply with an enforceable pollution prevention alternative, referred to as the Pollutant Management Plan. Direct discharging facilities must comply with numerical effluent limitations guidelines and standards.

Section 13.1 discusses and provides examples of facilities that are excluded from the TEC rule. Section 13.2 discusses implementation of numerical effluent limitations and pretreatment standards and provides examples of how these are applied. Section 13.3 discusses implementation of the Toxics Management Plan.

In addition, EPA is preparing a Permit Guidance Document to provide further assistance to the industry and the permitting/control authorities implementing this rule. (A copy may be obtained by writing to the EPA Office of Water Resource Center (RC-4100), 401 M Street, SW, Washington, DC, 20460, or by calling 202-260-7786.)

13.1 Facilities Excluded from the TECI Regulation

EPA has provided in the rule a low-flow exclusion for facilities that generate less than 100,000 gallons per year of TEC process wastewater (§442.1(b)(3)). Section 13.1.1 provides an example of how the low flow exclusion is applied. Note that the definition of TEC process wastewater (§442.2) specifically excludes wastewater generated from cleaning tank interiors for the purposes of maintenance and repair.

EPA has provided an exclusion for wastewaters associated with tank cleanings operated in conjunction with other industrial, commercial, or publicly-owned treatment works (POTW) operations, provided that the cleaning is limited to tanks that previously contained raw materials, by-products and finished products that are associated with the facility's on-site processes. On-site means the contiguous and non-contiguous established boundaries of a facility. Sections 13.1.2 and 13.1.3 provide examples of application of this exclusion.

A TEC facility may accept wastewater from off site and still be considered a TEC facility as long as the wastewater from off site also meets the definition of TEC process wastewater. If a TEC facility accepts wastewater from off site that is not generated from other tank cleaning activities, that facility may be considered a centralized waste treater (CWT) and may have to meet limitations applicable to the CWT industry.

The TEC effluent limitations are not applicable to wastewater generated from cleaning drums and intermediate bulk containers; however, EPA recognizes that many facilities that will be subject to the TEC effluent limitations also clean these types of containers. Section 13.1.4 provides guidance in applying the TEC effluent limitations for these facilities.

13.1.1 Low Flow Exclusion - Unregulated Wastewater

Example 1: An indirect discharging TEC facility cleans rail tank cars for both shipping products and repair. The facility discharges an average of 360,000 gallons of wastewater per year and performs an average of 360 cleanings per year. All tanks last transported chemical and petroleum cargos. According to facility records, approximately 75% of all cleanings are performed for the purpose of maintenance and repair on the tank, with the remainder performed for the purpose of shipping. The facility operates year round.

By definition, only 25% of the facility's total average annual wastewater flow, 90,000 gallons per year, is considered TEC process wastewater. This facility qualifies for the low flow exclusion because it discharges less than 100,000 gallons per year of TEC process wastewater, and is therefore not subject to TEC effluent limitations. Facilities discharging less than 100,000 gallons per year of TEC process wastewater will remain subject to limitations and standards established on a case-by-case basis using Best Professional Judgement by the permitting authority.

13.1.2 Manufacturing Facility Covered by Another Point Source Category

Example 2: A chemical manufacturer, subject to the Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) effluent guideline (40 CFR 414), manufacturers bulk organic chemicals for sale and distribution. The facility holds a NPDES permit with limitations based on 40 CFR 414.71 and 414.73. In addition to manufacturing chemicals, the facility transports chemicals in tank trucks and occasionally cleans the interiors of tank trucks when changing cargos for delivery. Based on data collected over the previous five years, the greatest number of tank trucks cleaned in a given year is 200 tanks, and the average is 178 tanks. The average annual volume of tank cleaning wastewater discharged is 140,000 gallons. Tank cleaning wastewater is combined with chemical manufacturing wastewater (14 millions gallons per year) for treatment in the facility's on-site treatment facility. The facility operates 365 days per year.

As specified in §442.1(b)(1), the TECI effluent guidelines do not apply to "wastewater associated with tank cleanings operated in conjunction with other industrial...operations, provided that the cleaning is limited to tanks that previously contained raw materials, by-products, or finished products that are associated with the facility's on-site processes." Although this facility is not subject to 40 CFR 442, wastewater discharges from tank truck cleaning may be permitted under 40 CFR 414 or any other applicable point source category.

13.1.3 Manufacturing Facility Not Covered by Another Point Source Category

Example 3: A grape juice processing facility cleans tank trucks that contained processed juice. The facility discharges to a local POTW and is not required to monitor their effluent discharges. The facility cleans (on average) 350 tank trucks per year and discharges 1,000 gallons of wastewater per tank cleaning. Wastewater is generated from interior, exterior, and equipment and floor washings. The facility also discharges over 5,000 gallons per day of wastewater from juice processing. All waste streams are commingled prior to discharge, without pretreatment. The facility operates 350 days per year.

This facility is not currently subject to another point source category, but generates a significant volume of tank cleaning wastewater, 350,000 gallons per year. However, as described in §442.1(b)(1), the TECI effluent guidelines do not apply to "wastewater associated with tank cleanings operated in conjunction with other industrial...operations, provided that the cleaning is limited to tanks that previously contained raw materials, by-products, or finished products that are associated with the facility's on-site processes." Therefore, this facility is not subject to 40 CFR 442. The facility may be subject to local pretreatment limits as necessary to prevent pass-through or interference.

Example 4: An inorganic chemical manufacturer operates a distribution center 100 miles from its main facility where all chemicals are manufactured. The facility mainly operates as a chemical distributor (e.g., unloading and loading products), but it also cleans tank trucks for change of cargo. The wastewater generated from tank cleaning is not currently covered by a point source category, and is discharged to a local POTW without pretreatment. The distributor cleans an average of 600 tank trucks per year and discharges 210,000 gallons of tank cleaning wastewater per year. The facility has no other significant sources of process wastewater. The distributor operates 180 days per year.

As described in §442.1(b)(1), the TECI effluent guidelines do not apply to "wastewater associated with tank cleanings operated in conjunction with other industrial, commercial, or POTW operations, provided that the cleaning is limited to tanks that previously contained raw materials, by-products, or finished products that are associated with the facility's on-site processes." EPA has provided a revised definition for "on-site" that includes contiguous and non-contiguous property within the established boundary of a facility.

EPA believes its exclusion for other industrial, commercial, or POTW facilities allows the permitting authority a considerable amount of discretion in determining if the tank cleanings are performed as part of, or in addition to, the facilities on-site processes. In this example, the permit writer may exercise flexibility in setting local limitations and may determine that the TEC effluent limitations would be appropriate for use as the basis of the permit.

13.1.4 Facility That Cleans Tanks and IBCs

Example 5: A direct discharging TEC facility cleans tank trucks and intermediate bulk containers (IBCs) last containing chemical or petroleum cargos. The facility cleans 4,500 tank trucks per year and 1,800 IBCs per year. The facility discharges an average of 270 gallons of wastewater per tank truck or IBC cleaned.   The facility operates 350 days per year.

Discharges from this facility are subject to §442.11, §442.12, and §442.13 for the Truck/Chemical & Petroleum Subcategory. As stated under §442.1(b)(2), wastewater resulting from the cleaning of IBCs is not covered by 40 CFR 442; however, permit writers, using Best Professional Judgement, may provide a pollutant discharge allowance for non-categorical wastewater discharges such as IBC cleaning. EPA assumes that a permit writer would give this facility an allowance for the IBC cleanings since the facility cleans a significant number of IBCs each day and they may contribute significant pollutant loadings in the raw and treated wastewater. As a conservative estimate, a permit writer could assume that the wastewater characteristics from cleaning a tank truck are similar to that of cleaning an IBC.

13.2 Numerical Effluent Limitations

Using the effluent limitations guidelines and standards, the permitting authority will establish numerical discharge limitations for the facility and specify monitoring and reporting requirements. For direct discharging facilities, the effluent limitation guidelines are applicable to the final effluent discharged to U.S. surface waters. For indirect discharging facilities, pretreatment standards are applicable to the final effluent discharged to a POTW. This section provides guidance and examples on how the TECI effluent guidelines will be implemented.

Compliance monitoring should be performed on a frequency basis established by the permitting authority. EPA's monitoring costs for this regulation assumed compliance monitoring for conventional pollutants four times per month, and for priority and non-conventional pollutants once per month.

13.2.1 Single Subcategory Facility

Example 6: An indirect discharging TEC facility cleans rail tank cars that last transported fuel oil, lube oil, and sulfuric acid. The facility cleans 20 tanks per day and discharges an average of 10.4 million gallons of TEC process wastewater per year. The facility operates 260 days per year.

This facility's wastewater discharges are subject to Subpart B - Rail Tank Cars Transporting Chemical & Petroleum Cargos, Pretreatment Standards for Existing Sources (PSES) (§442.25). This facility would be required to monitor for SGT-HEM, fluoranthene, and phenanthrene and must comply with the following end-of-pipe discharge limitations:

Pollutant	Maximum Daily Concentration (mg/L)
SGT-HEM	26
Fluoranthene	0.076
Phenanthrene	0.34

13.2.2 Multiple Subcategory Facility

Example 7: An indirect discharging TEC facility cleans the interiors of tank trucks and rail tank cars. A wide range of cargos is cleaned, but all cargos are classified as chemical or petroleum (as defined in §442.2). The facility cleans, on average, 10 tank trucks and 3 rail cars per day. On average, the facility discharges 500 gallons of TEC process wastewater per tank truck cleaned and 2,000 gallons of TEC process wastewater per rail tank car cleaned. The facility also commingles into its treatment system 20 gallons per day of boiler blowdown. The facility operates 300 days per year.

This facility's wastewater discharge is subject to both Subpart A - Tank Trucks and Intermodal Tank Containers Transporting Chemical & Petroleum Cargos, PSES (§442.15) and Subpart B - Rail Tank Cars Transporting Chemical & Petroleum Cargos, PSES (§442.25). A permit writer would use the combined waste stream formula in Equation 1, set forth in 40 CFR 403.6(e), to establish effluent limitations. Note that the boiler blowdown waste stream is the only dilute waste stream at this facility.

$$C_T = \left(\frac{\sum_{i=1}^{N} C_i F_i}{\sum_{i=1}^{N} F_i} \right) \left(\frac{F_T - F_D}{F_T} \right) \qquad (1)$$

where:

C_T	=	Alternative concentration limit for the combined wastestream, (mg/L)
C_i	=	Concentration limit for a pollutant in the regulated stream i, (mg/L)
F_i	=	Average daily flow (at least a 30-day average) of regulated stream i, (gallons/day)
F_D	=	Average daily flow (at least 30-day average) of dilute waste stream(s), (gallons/day)

F_T	=	Average daily flow (at least a 30-day average) through the combined treatment facility (including regulated, unregulated, and dilute waste streams), (gallons/day)
N	=	Total number of regulated streams

An example for calculating the copper limit is provided:

Average daily Subpart A flow:

$$F_A = TPD_A * GPT = 10 * 500 = 5{,}000 \ gallons/day$$

Average daily Subpart B flow:

$$F_B = TPD_B * GPT = 3 * 2{,}000 = 6{,}000 \ gallons/day$$

where:

F	=	Average daily flow (at least a 30-day average) of regulated stream, (gallons/day)
TPD	=	Number of tanks cleaned per day, (tanks/day)
GPT	=	Gallons of TEC process wastewater generated per tank cleaned, (gallons/tank)

The average daily flow through the combined treatment system is the sum of F_A and F_B plus the boiler blowdown flow, or 11,020 gallons/ day. The maximum daily concentration limitation for copper for Subpart A is 0.84 mg/L (from §442.15). Copper is not regulated for Subpart B and this flow is considered an unregulated process flow. C_T for copper is calculated as:

$$C_T = \left(\frac{0.84 * 5{,}000}{5{,}000} \right) \left(\frac{11{,}020 - 20}{11{,}020} \right) = 0.84 \ mg/L$$

The same methodology would be used to establish pretreatment standards for all pollutants regulated under §442.15 and/or §442.25 (SGT-HEM, mercury, fluoranthene, and phenanthrene). SGT-HEM is the only pollutant regulated under both Subparts A and B. Because the SGT-HEM limitation is the same in both subparts (26 mg/L), C_T for SGT-HEM for this example facility is calculated as:

$$C_T = \left(\frac{(26 * 5{,}000) + (26 * 6{,}000)}{11{,}000} \right) \left(\frac{11{,}020 - 20}{11{,}020} \right) = 26 \; mg/L$$

13.2.3 Regulated and Unregulated Wastewater at a Facility

Example 8: An indirect discharging TEC facility cleans tank barges containing a variety of cargos, including petroleum and products such as gasoline, mineral spirits and xylene. The facility also cleans barge hoppers containing dry bulk cargos. The facility cleans a total of 165 tank barges per year and 1,120 hoppers per year. The facility discharges an average of 700 gallons of wastewater per barge hopper cleaned and 4,700 gallons of wastewater per chemical and petroleum barge cleaned. The facility operates 280 days per year.

This facility's wastewater discharge is subject to Subpart C - Tank Barges and Ocean/Sea Tankers Transporting Chemical & Petroleum Cargos, PSES (§442.35). EPA has not established PSES for the cleaning of barge hoppers. By definition, wastewater generated from cleaning closed-top hoppers is not considered TEC process wastewater and is not covered by 40 CFR 442. This flow will remain subject to limitations and standards established on a case-by-case basis using Best Professional Judgement by the permitting authority.

EPA found that hopper wastewater contains low levels of conventional and toxic pollutants. Permit writers should evaluate unregulated streams to determine whether they actually are acting as dilution. A local or state control authority can use its own legal authority to establish a limit more stringent than would be derived using the combined waste stream formula. In this example, EPA assumes that a permit writer would not give this facility an allowance for hopper cleanings and would consider it a dilution flow.

The annual volume of TEC process wastewater discharged by this facility is calculated as follows:

$$ANN = TPY * GPT = 165 * 4{,}700 = 775{,}500 \ gallons/year$$

where:

ANN	=	Annual TEC process wastewater flow, (gallons/year)
TPY	=	Number of tank barges cleaned per year (chemical and petroleum only), (tanks/year)
GPT	=	Gallons of TEC process wastewater generated per tank cleaned, (gallons/tank)

This facility does not qualify for the low flow exclusion because it discharges more than 100,000 gallons per year of TEC process wastewater.

The annual volume of wastewater generated from cleaning hoppers is:

$$ANN = TPY * GPT = 1{,}120 * 700 = 784{,}000 \ gallons/year$$

A permit writer would use the combined waste stream formula (see Equation (1)) to establish PSES since only a portion of the facility's discharge is subject to this rule. An example for calculating C_T for zinc is provided below. The maximum daily concentration limitation for zinc for Subpart C is 8.3 mg/L (from §442.35).

Average daily Subpart C flow:

$$F_i = \frac{ANN}{DPY} = \frac{775{,}500}{280} = 2{,}770 \ gallons/day$$

Average daily hopper flow (considered a dilution waste stream in this example):

$$F_D = \frac{ANN}{DPY} = \frac{784{,}000}{280} = 2{,}800 \;\; gallons/day$$

where:

F	=	Average daily flow (at least a 30-day average) of stream, (gallons/day)
ANN	=	Annual wastewater flow, (gallons/year)
DPY	=	Number of operating days per year

The average daily flow through the combined treatment facility:

$$F_T = \left(\frac{(165 \,*\, 4{,}700) \,+\, (1{,}120 \,*\, 700)}{280} \right) = 5{,}570 \;\; gallons/day$$

Alternative concentration limit:

$$C_T = \left(\frac{8.3 \,*\, 2{,}770}{2{,}770} \right) \left(\frac{5{,}570 \,-\, 2{,}800}{5{,}570} \right) = 4.1 \;\; mg/L$$

The same methodology would be used to establish pretreatment standards for all pollutants regulated under §442.35 (SGT-HEM, cadmium, chromium, copper, lead, mercury, nickel, and zinc).

13.3 <u>Pollutant Management Plan</u>

The permitting authority will establish a pollution prevention allowable discharge of wastewater pollutants, as defined in §442.2, if the facility agrees to a control mechanism or pretreatment agreement as specified in the applicable subpart(s).

14.0 ANALYTICAL METHODS

Section 304(h) of the Clean Water Act directs EPA to promulgate guidelines establishing test procedures (analytical methods) for analyzing pollutants. These test procedures are used to determine the presence and concentration of pollutants in wastewater, and are used for submitting applications and for compliance monitoring under the National Pollutant Discharge Elimination System (NPDES) found at 40 CFR Parts 122.41(j)(4) and 122.21(g)(7), and for the pretreatment program found at 40 CFR 403.7(d). Promulgation of these methods is intended to standardize analytical methods within specific industrial categories and across industries.

EPA has promulgated analytical methods for monitoring pollutant discharges at 40 CFR Part 136, and has promulgated methods for analytes specific to given industrial categories at 40 CFR Parts 400 to 480. In addition to the methods developed by EPA and promulgated at 40 CFR Part 136, certain methods developed by others[1] have been incorporated by reference into 40 CFR Part 136.

EPA promulgated Method 1664, the analytical method for HEM and SGT-HEM, on May 14, 1999 (see 64 FR 26315) to support phaseout of use of CFC-113. This rulemaking revised 40 CFR 136 to list Method 1664 as an approved method to analyze oil and grease and non-polar material (i.e., HEM and SGT-HEM). Note that EPA will allow continued use of methods that use CFC-113 through the extension to the laboratory use exemption of CFC-113 through 2005; however, EPA strongly encourages dischargers/generators/industrial users and permit authorities to substitute use of Method 1664 for CFC-113 methods. Method 1664 will be used in EPA's wastewater program for regulation development, permit applications, and compliance monitoring. In anticipation of promulgation of Method 1664, data collected by EPA in support of the TECI effluent guideline utilized Method 1664. Therefore, all effluent limitations

[1]For example, the American Public Health Association publishes *Standard Methods for the Examination of Water and Wastewater*.

promulgated for oil and grease (HEM) and non-polar material (SGT-HEM) in this effluent guideline are to be measured by Method 1664.

For this final rule, EPA is regulating certain conventional, priority, and nonconventional pollutants as identified in Section 12.0. The methods proposed for monitoring the regulated pollutants are briefly discussed in the following sections:

- Section 14.1: Semivolatile Organic Compounds;
- Section 14.2: Metals;
- Section 14.3: Hexane Extractable Material and Silica-Gel Treated Hexane Extractable Material;
- Section 14.4: Biochemical Oxygen Demand; and
- Section 14.5: Total Suspended Solids.

Section 14.6 lists the references used in this section.

14.1 Semivolatile Organic Compounds

Semivolatile organic compounds are analyzed by EPA Method 1625, Revision C (1). In this method, samples are prepared by liquid-liquid extraction with methylene chloride in a separatory funnel or continuous liquid-liquid extractor. Separate acid and base/neutral extracts are concentrated and analyzed by high resolution gas chromatography (HRGC) combined with low resolution mass spectrometry (LRMS). The detection limit of the method is usually dependent upon interferences rather than instrument limitations. With no interferences present, minimum levels of 10, 20, or 50 µg/L (ppb) can be achieved, depending upon the specific compound.

14.2 Metals

Metals are analyzed by EPA Method 1620 (2). This method is a consolidation of the EPA 200 series methods for the quantitative determination of 27 trace elements by inductively coupled plasma (ICP) and graphite furnace atomic adsorption (GFAA), and determination of mercury by cold vapor atomic absorption (CVAA). The method also provides a semiquantitative ICP screen for 42 additional elements. The ICP technique measures atomic emissions by optical spectroscopy. GFAA measures the atomic absorption of a vaporized sample, and CVAA measures the atomic absorption of mercury vapor. Method detection limits (MDLs) are influenced by the sample matrix and interferences. With no interferences present, compound-specific MDLs ranging from 0.1 to 75 μg/L (ppb) can be achieved.

14.3 Hexane Extractable Material and Silica-Gel Treated Hexane Extractable Material

Hexane Extractable Material (HEM; formerly known as oil and grease) and Silica-Gel Treated Hexane Extractable Material (SGT-HEM) are analyzed by EPA Method 1664 (3). In this method, a 1-L sample is acidified and serially extracted three times with n-hexane. The solvent is evaporated from the extract and the HEM is weighed. For SGT-HEM analysis, the HEM is redissolved in n-hexane and an amount of silica gel proportionate to the amount of HEM is added to the HEM solution to remove adsorbable materials. The solution is filtered to remove the silica gel, the solvent is evaporated, and the SGT-HEM is weighed. This method is capable of measuring HEM and SGT-HEM in the range of 5 to 1,000 mg/L (ppm), and may be extended to higher concentrations by analysis of a smaller sample volume.

14.4 Biochemical Oxygen Demand

Biochemical oxygen demand (BOD_5) is a measure of the relative oxygen requirements of wastewaters, effluents, and polluted waters. BOD_5 is measured by EPA Method 405.1 (4). The BOD_5 test specified in this method is an empirical bioassay-type procedure that measures dissolved oxygen consumed by microbial life while assimilating and oxidizing the organic matter present. The standard test conditions include dark incubation at 20°C for a five-day period, and the reduction in dissolved oxygen concentration during this period yields a measure of the biological oxygen demand. The practical minimum level of determination is 2 mg/L (ppm).

14.5 Total Suspended Solids

Total suspended solids (TSS) is measured using EPA Method 160.2 (4). In this method, a well-mixed sample is filtered through a pre-weighed glass fiber filter. The filter is dried to constant weight at 103 -105°C. The weight of material on the filter divided by the sample volume is the amount of TSS. The practical range of the determination is 4 - 20,000 mg/L (ppm).

14.6 References[2]

1. U.S. Environmental Protection Agency. Method 1625, Revision C: Semivolatile Organic Compounds by Isotope Dilution GCMS, June 1989 (DCN T10220).

2. U.S. Environmental Protection Agency. Method 1620: Metals by Inductively Coupled Plasma Atomic Emission Spectroscopy and Atomic Absorption Spectroscopy, September 1989 (DCN T10224).

3. U.S. Environmental Protection Agency. Method 1664, Revision A: n-Hexane Extractable Material (HEM: Oil and Grease) and Silica Gel Treated n-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry, EPA-821-R-98-002, February 1999. (DCN T20485).

4. U.S. Environmental Protection Agency. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1983. (DCN T10228).

[2] For those references included in the administrative record supporting the TECI rulemaking, the document control number (DCN) is included in parentheses at the end of the reference.

15.0 GLOSSARY

Administrator - The Administrator of the U.S. Environmental Protection Agency.

Agency - The U.S. Environmental Protection Agency.

Ballast Water Treatment Facility - A facility which accepts for treatment ballast water or any water which has contacted the interior of cargo spaces or tanks in an ocean/sea tanker.

Baseline Loadings - Pollutant loadings in TEC wastewater currently being discharged to POTWs or U.S. surface waters. These loadings take into account wastewater treatment currently in place at TEC facilities.

BAT - The best available technology economically achievable, as described in Sec. 304(b)(2) of the Clean Water Act.

BCT - The best conventional pollutant control technology, as described in Sec. 304(b)(4) of the Clean Water Act.

BMP - Best management practice. Section 304(e) of the Clean Water Act gives the Administrator the authority to publish regulations to control plant site runoff, spills, or leaks, sludge or waste disposal, and drainage from raw material storage.

BOD_5 - Five day biochemical oxygen demand. A measure of biochemical decomposition of organic matter in a water sample. It is determined by measuring the dissolved oxygen consumed by microorganisms to oxidize the organic matter in a water sample under standard laboratory conditions of five days and 20° C, see Method 405.1. BOD_5 is not related to the oxygen requirements in chemical combustion.

BPT - The best practicable control technology currently available, as described in Sec. 304(b)(1) of the Clean Water Act.

Builder/Leaser - A facility that manufactures and/or leases tank trucks, closed-top hopper tank trucks, intermodal tank containers, rail tank cars, closed-top hopper rank tank cars, tank barges, closed-top hopper barges, and/or ocean/sea tankers, and that cleans the interiors of these tank after equipment has been placed in service.

CAA - Clean Air Act. The Air Pollution Prevention and Control Act (42 U.S.C. 7401 et. seq.), as amended, inter alia, by the Clean Air Act Amendments of 1990 (Public Law 101-549, 104 Stat. 2399).

Cargo - Any chemical, material, or substance transported in a tank truck, closed-top hopper truck, intermodal tank container, rail tank car, closed-top hopper rail car, tank barge, closed-top hopper barge, ocean/sea tanker, or a similar tank that comes in direct contact with the chemical, material, or substance. A cargo may also be referred to as a commodity.

Carrier-Operated (Carrier) - A facility that owns, operates, and cleans a tank fleet used to transport commodities or cargos for other companies.

Centralized Waste Treater (CWT) - A facility that recycles, reclaims, or treats any hazardous or nonhazardous industrial wastes received from off site.

Centralized Waste Treaters Effluent Guideline - see proposed 40 CFR Part 437, 60 FR 5464, January 27, 1995.

CFR - Code of Federal Regulations, published by the U.S. Government Printing Office. A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the federal government.

Chemical Cargo - Chemical cargos include, but are not limited to, the following cargos: latex; rubber; plastic; plasticizers; resins; soaps; detergents; surfactants; agricultural chemicals and pesticides; hazardous waste; organic chemicals including: alcohols, aldehydes, formaldehydes, phenols, peroxides, organic salts, amines, amides, other nitrogen compounds, other aromatic compounds, aliphatic organic chemicals, glycols, glycerines, and organic polymers; refractory organic compounds including: ketones, nitriles, organo-metallic compounds containing chromium, cadmium, mercury, copper, zinc; and inorganic chemicals including: aluminum sulfate, ammonia, ammonium nitrate, ammonium sulfate, and bleach. Cargos which are not considered to be foodgrade, petroleum, or dry bulk goods are considered to be chemical cargos.

Classical Pollutants - A general term for parameters, including conventional pollutants, that are commonly analyzed by a wet chemistry laboratory. Classical pollutants may also be referred to as classical wet chemistry parameters.

Classical Wet Chemistry Parameters- A general term for parameters, including conventional pollutants, that are commonly analyzed by a wet chemistry laboratory. Classical wet chemistry parameters may also be referred to as classical pollutants.

Closed-Top Hopper Rail Car - A completely enclosed storage vessel pulled by a locomotive that is used to transport dry bulk commodities or cargos over railway access lines. Closed-top hopper rail cars are not designed or contracted to carry liquid commodities or cargos and are typically used to transport grain, soybeans, soy meal, soda ash, lime, fertilizer, plastic pellets, flour, sugar, and similar commodities or cargos. The commodities or cargos transported come in direct contact with the hopper interior. Closed-top hopper rail cars are typically divided into three compartments, carry the same commodity or cargo in each compartment, and are generally top loaded and bottom unloaded. The hatch covers on closed-top hopper rail cars are typically longitudinal hatch covers or round manhole covers.

Closed-Top Hopper Truck - A motor-driven vehicle with a completely enclosed storage vessel used to transport dry bulk commodities or cargos over roads and highways. Closed-top hopper trucks are not designed or constructed to carry liquid commodities or cargos and are typically used to transport grain, soybeans, soy meal, soda ash, lime, fertilizer, plastic pellets, flour, sugar, and similar commodities or cargos. The commodities or cargos transported come in direct contact with the hopper interior. Closed-top hopper trucks are typically divided into three compartments, carry the same commodity or cargo in each compartment, and are generally top loaded and bottom unloaded. The hatch covers used on closed-top hopper trucks are typically longitudinal hatch covers or round manhole covers. Closed-top hopper trucks are also commonly referred to as dry bulk hoppers.

Closed-Top Hopper Barge - A non-self-propelled vessel constructed or adapted primarily to carry dry commodities or cargos in bulk through rivers and inland waterways, and may occasionally carry commodities or cargos through oceans and seas when in transit from one inland waterway to another. Closed-top hopper barges are not designed to carry liquid commodities or cargos and are typically used to transport corn, wheat, soy beans, oats, soy meal, animal pellets, and similar commodities or cargos. The commodities or cargos transported come in direct contact with the hopper interior. The basic types of tops on closed-top hopper barges are telescoping rolls, steel lift covers, and fiberglass lift covers.

COD - Chemical oxygen demand. A nonconventional, bulk parameter that measures the oxygen-consuming capacity of refractory organic and inorganic matter present in water or wastewater. COD is expressed as the amount of oxygen consumed from a chemical oxidant in a specific test, see Methods 410.1 through 401.4.

Commercial TEC Facility - A TEC facility that performs 50 percent of their cleanings for commercial customers. Many of these facilities perform 90 percent or more commercial cleanings.

Commodity - Any chemical, material, or substance transported in a tank truck, closed-top hopper truck, intermodal tank container, rail tank car, closed-top hopper rail car, tank barge, closed-top hopper barge, ocean/sea tanker, or similar tank that comes in direct contact with the chemical, material, or substance. A commodity may also be referred to as a cargo.

Consignee - Customer or agent to whom commodities or cargos are delivered.

Contract Hauling - The removal of any waste stream from the facility by a company authorized to transport and dispose of the waste, excluding discharges to sewers of surface waters.

Conventional Pollutants - The pollutants identified in Sec. 304(a)(4) of the Clean Water Act and the regulations thereunder (i.e., biochemical oxygen demand (BOD_5), total suspended solids (TSS), oil and grease, fecal coliform, and pH).

CWA - Clean Water Act. The Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. 1251 et seq.), as amended, inter alia, by the Clean Water Act of 1977 (Public Law 95-217) and the Water Quality Act of 1987 (Public Law 100-4).

Daily Discharge - The discharge of a pollutant measured during any calendar day or any 24-hour period that reasonably represents a calendar day.

Dairy Products Processing Effluent Guideline - see 40 CFR Part 405.

Detailed Questionnaire - The 1994 Detailed Questionnaire for the Transportation Equipment Cleaning Industry.

Direct Capital Costs - One-time capital costs associated with the purchase, installation, and delivery of a specific technology. Direct capital costs are estimated by the TECI cost model.

Direct Discharger - A facility that conveys or may convey untreated or facility-treated process wastewater or nonprocess wastewater directly into surface waters of the United States, such as rivers, lakes, or oceans. (See Surface Waters definition.)

Discharge - The conveyance of wastewater to: (1) United States surface waters such as rivers, lakes, and oceans, or (2) a publicly-owned, privately-owned, federally-owned, centralized, or other treatment works.

Drum - A metal or plastic cylindrical container with either an open-head or a tight-head (also known as bung-type top) used to hold liquid, solid, or gaseous commodities or cargos which are in direct contact with the container interior. Drums typically range in capacity from 30 to 55 gallons.

Dry Bulk Cargo - A cargo which includes dry bulk products such as fertilizers, grain, and coal grain, soybeans, soy meal, soda ash, lime, fertilizer, plastic pellets, flour, sugar, and similar commodities or cargos.

EA - Economic assessment. An analysis which estimates the economic impacts of compliance costs on facilities, firms, employment, domestic and international market, inflation, distribution, environmental justice, and transportation equipment cleaning customers.

Effluent - Wastewater discharges.

Effluent Limitation - Any restriction, including schedules of compliance, established by a State or the Administrator on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources into navigable waters, the waters of the contiguous zone, or the ocean. (CWA Sections 301(b) and 304(b).)

Emission - Passage of air pollutants into the atmosphere via a gas stream or other means.

EPA - The U.S. Environmental Protection Agency.

Facility - A facility is all contiguous and non-contiguous property within established boundaries owned, operated, leased, or under the control of the same corporation or business entity. The property may be divided by public or private right-of-way.

Federally-Owned Treatment Works (FOTW) - Any device or system owned and/or operated by a United States Federal Agency to recycle, reclaim, or treat liquid sewage or liquid industrial wastes.

Food Grade Cargo - Food grade cargos include edible and non-edible food products. Specific examples of food grade products include but are not limited to: alcoholic beverages, animal by-products, animal fats, animal oils, caramel, caramel coloring, chocolate, corn syrup and other corn products, dairy products, dietary supplements, eggs, flavorings, food preservatives, food products that are not suitable for human consumption, fruit juices, honey, lard, molasses, non-alcoholic beverages, salt, sugars, sweeteners, tallow, vegetable oils, vinegar, and pool water.

FR - Federal Register, published by the U.S. Government Printing Office, Washington, D.C. A publication making available to the public regulations and legal notices issued by federal agencies.

Hazardous Air Pollutants (HAPs) - Substances listed by EPA as air toxics under Section 112 of the Clean Air Act.

Heel - Any material remaining in a tank or container following unloading, delivery, or discharge of the transported cargo. Heels may also be referred to as container residue, residual materials or residuals.

Hexane Extractable Material (HEM) - A method-defined parameter that measures the presence of relatively nonvolatile hydrocarbons, vegetable oils, animal fats, waxes, soaps, greases, and related materials that are extractable in the solvent n-hexane. See Method 1664. HEM is also referred to as oil and grease.

Independent - A facility that provides cleaning services on a commercial basis, either as a primary or secondary business, for tanks which they do not own or operate.

Indirect Capital Costs - One-time capital costs that are not technology-specific and are represented as a multiplication factor that is applied to the direct capital costs estimated by the TECI cost model.

Indirect Discharger - A facility that discharges or may discharge pollutants into a publicly-owned treatment works (POTW).

Industrial Waste Combusters Effluent Guidelines - see 40 CFR Part 444, FR 6518, January 27, 2000.

In-house TEC Facility - A TEC facility that performs less than 50 percent of their cleanings for commercial clients. In-house TEC facilities primarily clean their own transportation equipment and have very few commercial clients. Most of these facilities perform less than 10 percent of their total cleanings for commercial clients.

Inorganic Chemicals Manufacturing Effluent Guidelines - see 40 CFR Part 415.

Intermediate Bulk Container (IBC or Tote) - A completely enclosed storage vessel used to hold liquid, solid, or gaseous commodities or cargos which are in direct contact with the tank interior. Intermediate bulk containers may be loaded onto flat beds for either truck or rail transport, or onto ship decks for water transport. IBCs are portable containers with 450 liters (119 gallons) to 3,000 liters (793 gallons) capacity. IBCs are also commonly referred to as totes.

Intermodal Tank Container - A completely enclosed storage vessel used to hold liquid, solid, or gaseous commodities or cargos which come in direct contact with the tank interior. Intermodal tank containers may be loaded onto flat beds for either truck or rail transport, or onto ship decks for water transport. Containers larger than 3,000 liters capacity are considered intermodal tank containers. Containers smaller than 3,000 liters capacity are considered IBCs.

MP&M - Metal Products & Machinery Effluent Guidelines, new regulation to be proposed in 2000 (designated as 40 CFR Part 438).

New Source - As defined in 40 CFR 122.2 and 122.29, and 403.3(k), a new source is any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced (1) for purposes of compliance with New Source Performance Standards, after the promulgation of such standards under CWA Section 306; or (2) for the purposes of compliance with Pretreatment Standards for New Sources, after the publication of proposed standards under CWA Section 307(c), if such standards are thereafter promulgated in accordance with that section.

Nonconventional Pollutant - Pollutants other than those specifically defined as conventional pollutants (identified in Section 304(a)(4) of the Clean Water Act) or priority pollutants (identified in 40 CFR Part 423, Appendix A).

Nondetect Value - A concentration-based measurement reported below the sample-specific detection limit that can reliably be measured by the analytical method for the pollutant.

Non-Polar Material - A method-defined parameter that measures the presence of mineral oils that are extractable in the solvent n-hexane and not adsorbed by silica gel. See Method 1664. Non-polar material is also referred to as SGT-HEM.

Nonprocess Wastewater - Wastewater that is not generated from industrial processes or that does not come into contact with process wastewater. Nonprocess wastewater includes, but is not limited to, wastewater generated from restrooms, cafeterias, and showers.

Non-Water Quality Environmental Impact - An environmental impact of a control or treatment technology, other than to surface waters.

NPDES - The National Pollutant Discharge Elimination System authorized under Sec. 402 of the CWA. NPDES requires permits for discharge of pollutants from any point source into waters of the United States.

NRDC - Natural Resources Defense Council.

NSPS - New source performance standards, under Sec. 306 of the CWA.

Ocean/Sea Tanker - A self- or non-self-propelled vessel constructed or adapted to transport commodities or cargos in bulk in cargo spaces (or tanks) through oceans and seas, where the commodity or cargo carried comes in direct contact with the tank interior. There are no maximum or minimum vessel or tank volumes.

OCPSF - Organic Chemicals, Plastics, and Synthetic Fibers Manufacturing Effluent Guideline, see 40 CFR Part 414.

Off Site - "Off site" means outside the established boundaries of the facility.

Oil and Grease (O&G) - A method-defined parameter that measures the presence of relatively nonvolatile hydrocarbons, vegetable oils, animal fats, waxes, soaps, greases, and related materials that are extractable in either n-hexane (referred to as HEM, see Method 1664) or Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane, see Method 413.1). Data collected by EPA in support of the TECI effluent guideline utilized Method 1664.

On Site - "On site" means within the established boundaries of the facility.

Operating and Maintenance (O&M) Costs - All costs related to operating and maintaining a treatment system for a period of one year, including the estimated costs for compliance wastewater monitoring of the effluent.

Petroleum Cargo - Petroleum cargos include the products of the fractionation or straight distillation of crude oil, redistillation of unfinished petroleum derivatives, cracking, or other refining processes. For purposes of this rule, petroleum cargos also include products obtained from the refining or processing of natural gas and coal. Specific examples of petroleum products include, but are not limited to: asphalt; benzene; coal tar; crude oil; cutting oil; ethyl benzene; diesel fuel; fuel additives; fuel oils; gasoline; greases; heavy, medium, and light oils; hydraulic fluids, jet fuel; kerosene; liquid petroleum gases (LPG) including butane and propane; lubrication oils; mineral spirits; naphtha; olefin, paraffin, and other waxes; tall oil; tar; toluene; xylene; and waste oil.

Petroleum Refining Effluent Guidelines - see 40 CFR Part 415.

PNPL - Production Normalized Pollutant Loading. Untreated wastewater pollutant loading generated per tank cleaning.

Point Source Category - A category of sources of water pollutants.

Pollutants of Interest - Pollutants that meet the following criteria are considered pollutants of interest: detected two or more times in the subcategory raw wastewater characterization data or one time for the Food, Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories, and an average treatment technology option influent concentration greater than or equal to five times their analytical method detection limit. All pollutants of interest that were removed by the technology bases were used in the environmental assessment and cost effectiveness analyses.

Pollution Prevention - The use of materials, processes, or practices that reduce or eliminate the creation of pollutants or wastes. It includes practices that reduce the use of hazardous and nonhazardous materials, energy, water, or other resources, as well as those practices that protect natural resources through conversation or more efficient use. Pollution prevention consists of source reduction, in-process recycle and reuse, and water conservation practices.

Post-Compliance Loadings - Pollutant loadings in TEC wastewater following implementation of each regulatory option. These loadings are calculated assuming that all TEC facilities would operate wastewater treatment technologies equivalent to the technology bases for the selected regulatory options.

POTW - Publicly-owned treatment works, as defined at 40 CFR 403.3(o).

PPA - Pollution Prevention Act. The Pollution Prevention Act of 1990 (42 U.S.C. 13101 et. seq., Pub. Law 101-508), November 5, 1990.

Prerinse - Within a TEC cleaning process, a rinse, typically with hot or cold water, performed at the beginning of the cleaning sequence to remove residual material (i.e., heel) from the tank interior.

Presolve Wash - Use of diesel, kerosene, gasoline, or any other type of fuel or solvent as a tank interior cleaning solution.

Pretreatment Standard - A regulation that establishes industrial wastewater effluent quality required for discharge to a POTW. (CWA Section 307(b).)

Priority Pollutants - The pollutants designated by EPA as priority in 40 CFR Part 423, Appendix A.

Privately-Owned Treatment Works - Any device or system owned and operated by a private company that is used to recycle, reclaim, or treat liquid industrial wastes not generated by that company.

Process Wastewater - Any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

PSES - Pretreatment standards for existing sources, under Sec. 307(b) of the CWA.

PSNS - Pretreatment standards for new sources, under Sec. 307(b) and (c) of the CWA.

Rail Tank Car - A completely enclosed storage vessel pulled by a locomotive that is used to transport liquid, solid, or gaseous commodities or cargos over railway access lines. A rail tank car storage vessel may have one or more storage compartments, and the stored commodities or cargos come in direct contact with the tank interior. There are no maximum or minimum vessel or tank volumes.

RCRA - Resource Conservation and Recovery Act (PL 94-580) of 1976, as amended (42 U.S.C. 6901, et. seq.).

RREL - U. S. Environmental Protection Agency, Office of Research and Development, Risk Reduction Engineering Laboratory.

Screener Questionnaire - The 1993 Screener Questionnaire for the Transportation Equipment Cleaning Industry.

Shipper-Operated (Shipper) - A facility that transports or engages a carrier for transport of their own commodities or cargos and cleans the fleet used for such transport. Also included in the scope of this definition are facilities which provide tank cleaning services to fleets that transport raw materials to their location.

SIC - Standard industrial classification. A numerical categorization system used by the U.S. Department of Commerce to catalogue economic activity. SIC codes refer to the products, or group of products, produced or distributed, or to services rendered by an operating establishment. SIC codes are used to group establishments by the economic activities in which they are engaged. SIC codes often denote a facility's primary, secondary, tertiary, etc. economic activities.

Silica Gel Treated Hexane Extractable Material (SGT-HEM) - A method-defined parameter that measures the presence of mineral oils that are extractable in the solvent n-hexane and not adsorbed by silica gel. See Method 1664. SGT-HEM is also referred to as non-polar material.

Source Reduction - Any practice which reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment prior to recycling, treatment, or disposal. Source reduction can include equipment or technology modifications, process or procedure modifications, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control.

Surface Waters - Waters including, but not limited to, oceans and all interstate and intrastate lakes, rivers, streams, mudflats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, and natural ponds.

Tank - A generic term used to describe any closed container used to transport commodities or cargos. The commodities or cargos transported come in direct contact with the container interior, which is cleaned by TEC facilities. Examples of containers which are considered tanks include: tank trucks, closed-top hopper trucks, intermodal tank containers, rail tank cars, closed-top hopper rail cars, tank barges, closed-top hopper barges, ocean/sea tankers, and similar tanks. Containers used to transport pre-packaged materials are not considered tanks, nor are 55-gallon drums or pails or intermediate bulk containers.

Tank Barge - A non-self-propelled vessel constructed or adapted primarily to carry commodities or cargos in bulk in cargo spaces (or tanks) through rivers and inland waterways, and may occasionally carry commodities or cargos through oceans and seas when in transit from one inland waterway to another. The commodities or cargos transported are in direct contact with the tank interior. There are no maximum or minimum vessel or tank volumes.

Tank Truck - A motor-driven vehicle with a completely enclosed storage vessel used to transport liquid, solid or gaseous materials over roads and highways. The storage vessel or tank may be detachable, as with tank trailers, or permanently attached. The commodities or cargos transported come in direct contact with the tank interior. A tank truck may have one or more storage compartments. There are no maximum or minimum vessel or tank volumes. Tank trucks are also commonly referred to as cargo tanks or tankers.

TECI - Transportation Equipment Cleaning Industry.

TEC Process Wastewater - All wastewaters associated with cleaning the interiors of tanks including: tank trucks; tank rail cars; intermodal tank containers; tank barges; and ocean/sea tankers used to transport commodities or cargoes that come into direct contact with the interior of the tank or container. At those facilities that clean tank interiors, TEC process wastewater includes wastewater generated from washing vehicle exteriors, equipment and floor washings, TEC-contaminated stormwater, wastewater pre-rinse cleaning solutions, chemical cleaning solutions, and final rinse solutions. TEC process wastewater is defined to include only wasterwater generated from a regulated TEC subcategory. Therefore, TEC process wastewater does not include wastewater generated from cleaning hopper cars, or from food grade facilities discharging to a POTW. Wastewater generated from cleaning tank interiors for purposes of shipping products (i.e., cleaned for purposes other than maintenance and repair) is considered TEC process wastewater. Wastewater generated from cleaning tank interiors for the purposes of maintenance and repair on the tank is not considered TEC process wastewater. Facilities that clean tank interiors solely for the purposes of repair and maintenance are not regulated under the TEC rule.

Total Annualized Cost - The sum of annualized total capital investment and O&M costs. Total capital investment costs are annualized by spreading them over the life of the project. These annualized costs are then added to the annual O&M costs.

Total Capital Investment - Total one-time capital costs required to build a treatment system (i.e., sum of direct and indirect capital costs).

Tote - A completely enclosed storage vessel used to hold liquid, solid, or gaseous commodities or cargos which come in direct contact with the vessel interior. Totes may be loaded onto flat beds for either truck or rail transport, or onto ship decks for water transport. There are no maximum or minimum values for tote volumes, although larger containers are generally considered to be intermodal tank containers. Totes are also referred to as intermediate bulk containers or IBCs. Fifty-five gallon drums and pails are not considered totes.

Transportation Equipment Cleaning Facility - Any facility that generates wastewater from cleaning the interior of tank trucks, closed-top hopper trucks, rail tank cars, closed-top hopper rail cars, intermodal tank containers, tank barges, closed-top hopper barges, ocean/sea tankers, and (excluding drums and intermediate bulk containers).

Treatment Effectiveness Concentration - Treated effluent pollutant concentration that can be achieved by each treatment technology that is part of a TECI regulatory option. Treatment effectiveness concentrations for each pollutant were developed for each treatment technology that removed the pollutant by 50 percent or greater.

Treatment, Storage, and Disposal Facility (TSDF) - A facility that treats, stores, or disposes hazardous waste in compliance with the applicable standards and permit requirements set forth in 40 CFR Parts 264, 265, 266, and 270.

TSS - Total suspended solids. A measure of the amount of particulate matter that is suspended in a water sample. The measure is obtained by filtering a water sample of known volume. The particulate material retained on the filter is then dried and weighed, see Method 160.2.

Untreated Loadings - Pollutant loadings in raw TEC wastewater. These loadings represent pollutant loadings generated by the TECI, and do no account for wastewater treatment currently in place at TEC facilities.

U.S.C. - The United States Code.

Zero Discharge Facility - A facility that does not discharge pollutants to waters of the United States or to a POTW. Also included in this definition are discharge or disposal of pollutants by way of evaporation, deep-well injection, off-site transfer to a treatment facility, and land application.